KOZUMI

AIR FORCE ONE 5

User Manual

V1.04

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Chapter 1. System Overview

1.1 Introduction

Kozumi outdoor high power Wireless 5.8Ghz CPE is the point of connection to Wireless Outdoor Network for service provider deploying last mile services to business or residential broadband subscribers. Network administrators can create multiple subscriber service tier using per-subscriber rate limiting features, and manage centrally. Kozumi outdoor CPE/AP utilizes a 200mW output Tx Power connect to the WiFi mesh or WDS infrastructure and provides the subscriber with an Ethernet connection for a local access.

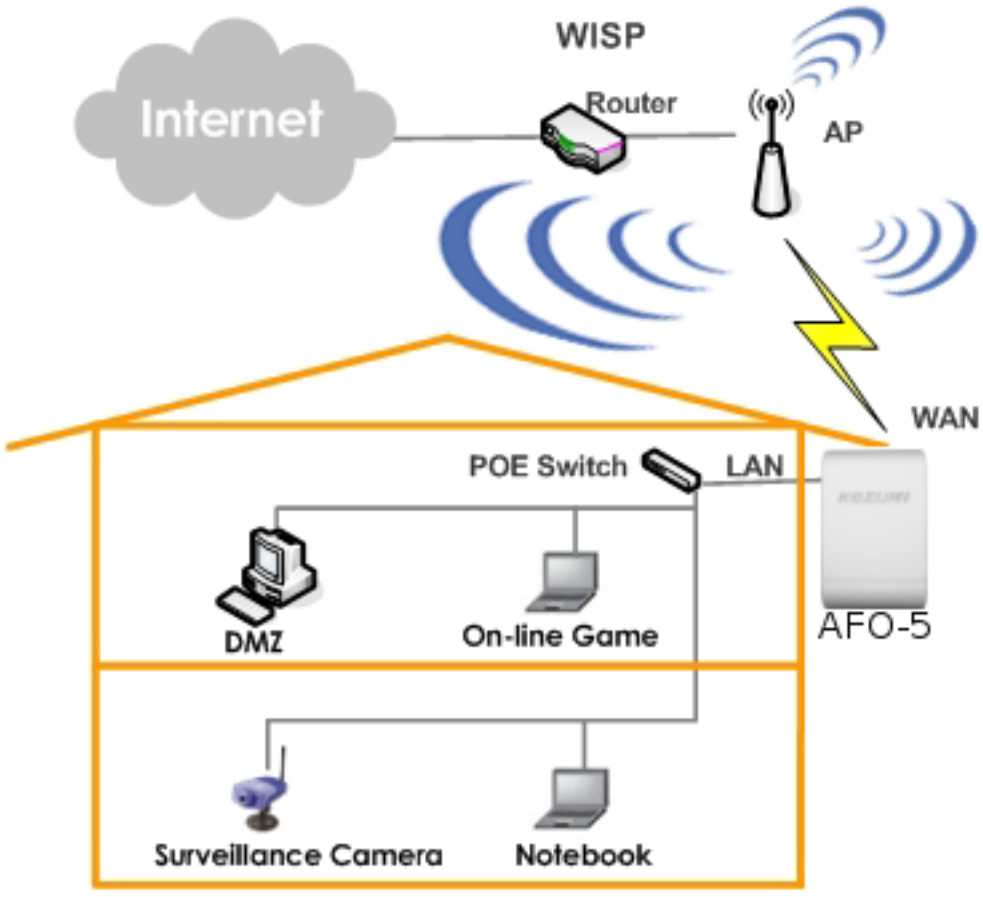
Kozumi outdoor high power Wireless 5.8Ghz CPE supports three operational modes, AP mode, WDS mode, CPE mode and Universal Repeater mode respectively with built-in remote management features simplify the deployment and reduce cost for continued maintenance of the outdoor bridge.

1. Access Point : It can be deployed as a traditional fixed wireless Access Point
2. WDS : It can be expanded Wireless Service as WDS Link
3. CPE (Customer Premises Equipment) : It is a wireless gateway with NAT and DHCP Server functions. That connects to Wireless Internet Service Provider's (WISP)
4. Universal Repeater : It extends the range of your wireless network while simultaneously allowing wired and wireless clients to access

1.2 System Concept

The "Air Force One 5" is designed with WISP's deployment needs in mind, especially the management capability and permission control with respect to management roles. The "Air Force One 5" can be used in many applications as below scenarios:

- Wireless CPE for Multi Dwelling Unit, MDU, /Multi Tenant Unit, MTU complexes, such as apartments, dormitories, and office complexes.
- Outdoor Access Point for school campuses, enterprise campuses, or manufacture plants.
- Indoor Access Point for hotels, factories, or warehouses where robust devices are required.
- Public hotspot operation for café, parks, convention centers, shopping malls, or airports.
- Wireless coverage for both indoor and outdoor premises for private resorts, acreage estate/home yards, or golf course communities.



1.3 Product Benefit

- IEEE 802.11n Draft 2.0 Compliance in 2Tx / 2Rx Design
- Support IEEE 802.11n and 802.11a
- Operates in the 5GHz ISM Band
- Enables Bandwidth of up to 300Mbps(Tx), 300Mbps(Rx) link rate
- Topology : Point to Point ; Point to Multi Point
- Operation Modes : Access Point(with WDS function), WDS(Pure WDS), CPE (Router Client) and Universal Repeater
- Security with 802.1X, WPA, and WPA2
- Support QoS & WMM
- Integrated Power over Ethernet (PoE)
- Multiple Virtual AP & Capability of Client Isolation
- Business-class WLAN Security and Client Authentications
- Provide Advanced Wireless Setting
- Support Web Management and SNMP MIB II
- Over Load Current Protection
- Wide Range Voltage Support (12-68VDC)
- Weather-Proof Housing (IP 68 Approved), M-13 RJ45 and N-Type Connector
- Client Isolation Through Layer 2 VLAN Technology
- QoS (Quality of Service) for bandwidth management and traffic prioritization

1.4 Specification

■ **Wireless and Wired Interface Standard**

➔ Wireless :

1. IEEE 802.11a (Up to 54Mbps)
2. IEEE 802.11n(draft 2.0) (Up to 300Mbps)

➔ Ethernet : 1 x IEEE 802.3 and IEEE 802.3u

■ **Wireless Radio**

➔ Frequency band : 5GHz

➔ Modulations :

1. 802.11a : OFDM with BPSK, QPSK, QAM and 64QAM
2. 802.11n : BPSK, QPSK, 16-QAM, 64-QAM

➔ Channels :

USA (Channel 36, 40, 44, 48, 52, 56, 60, 64, 149, 153, 157, 161)

Japan (Channel 34, 38, 42, 46)

Europe (Channel 36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140)

➔ Data Rate with auto fallback :

IEEE802.11a : 54, 48, 36, 24, 18, 12, 11, 9, 6, 5.5, 2 and 1 Mbps

IEEE802.11n(draft 2.0) : 300Mbps (Tx), 300Mbpx (Rx)

➔ Channel Bandwidth :

IEEE802.11a : 20 MHz

IEEE802.11n : 20/40 MHz

➔ Receiver Sensitivity : -97dBm

➔ RF transmission power : 23dBm /200mW

➔ Antenna: Embedded 14dbi Dual Phase Patch Antenna

■ **General Access Point Features**

➔ Number of ESSID : 8

➔ Number of associated clients per AP : 32

➔ Multiple mode : AP Mode, WDS Mode, CPE Mode and Universal Repeater Mode

➔ WDS Mode : to extend wireless coverage by connecting wirelessly to another WDS capable AP. Support up to 4 WDS links

➔ HT Tx/Rx Stream selection : 1 or 2

➔ Channel Bandwidth setting : 20MHz or 20/40MHz

➔ Short Slot support

➔ A-MSDU and A-MPDU support

➔ Maximal MPDU density for TX aggregation

➔ DFS (Dynamic Frequency Select) support

➔ TX burst support

➔ Beacon interval : adjustable to best adapt to the deployment environment

➔ IAPP : to facilitate faster roaming for the stations among different APs nearby

➔ RTS and fragmentation control

➔ Adjustable transmission power : 100 %

➔ Wireless site survey : for scanning the surrounding access points for connection

➔ VLAN tag support

■ **Gateway Features in the CPE Mode**

➔ Built-in NAT mode : to support IP sharing on the LAN side for multiple users(subscribers) to get access to the

Internet

- ➔ Support three reconnect type on PPPoE Mode : Always On, On Demand and Manual
- ➔ MAC Cloning
- ➔ Built-in DHCP server for issuing local IP addresses
- ➔ Built-in DHCP client and PPPoE client on the Wi-Fi WAN side
- ➔ Built-in DNS proxy
- ➔ Built-in Dynamic DNS
- ➔ IP/ Port forwarding and DMZ
- ➔ IP/ MAC rule filtering
- ➔ Bandwidth traffic Shaping

■ **Security**

- ➔ Data encryption : WEP (64/128-bits), WPA/WPA2 with TKIP or AES-CCMP
- ➔ User Authentication : WEP, IEEE 802.1X, WPA-Enterprise, WPA2-Enterprise, MAC ACL
- ➔ Setting for TKIP/ CCMP/AES key's refreshing period
- ➔ Hidden ESSID : broadcast SSID option can be turned off to prevent SSID broadcast to the public
- ➔ Station Isolation setting : when enabled, all stations associated with this AP can not communicate with each other
- ➔ Support data encryption over WDS link (WEP, AES, TKIP)

■ **Quality of Service (QoS)**

- ➔ Download and Upload traffic control
- ➔ Packet classifications via DSCP (Differentiated Services Code Point)
- ➔ Control Policy by IP/ IP Ranges/ MAC/ Service
- ➔ Layer-7 Protocol Support

- ➔ Traffic Analysis and Statistics
- ➔ No. of Max. Policy setting : 10
- ➔ DiffServ/ TOS
- ➔ IEEE802.11p/ COS
- ➔ IEEE802.11Q Tag VLAN priority control
- ➔ IEEE802.11e WMM

■ **Administration**

- ➔ Web-based management interface
- ➔ Remote configuration and management
- ➔ Remote firmware upgradeable
- ➔ Software one-button-click to reset back to factory defaults
- ➔ Utilities for system configuration backup and restoration
- ➔ SNMP MIBII support (v1/ v2c/ v3)
- ➔ NTP time synchronization
- ➔ Syslog client
- ➔ Support Event Log
- ➔ CLI access via Telnet and SSH
- ➔ WEB Access via HTTP and HTTPS
- ➔ Support statistics on total transmission encountered and transmitting error occurred
- ➔ Support UPnP (Universal Plug and Play)

■ **Hardware Specifications**

- ➔ Plastic case : weather proof

➔ On board over load current protection

➔ LED Indication : Power x 1; Ethernet x 1; Wireless x 1

■ **Physical and Power**

➔ PoE : DC 24V/ 0.5 A

➔ Form factor : Pole Mountable

➔ Dimensions (W x D x H) : 6.5” x 3.8” x 1.9” (165 x 96 x 48 mm)

➔ Weight: 0.35kg

■ **Environment**

➔ Operation temperature : -30℃ ~ 60℃

➔ Storage temperature : -30℃ ~ 85℃

➔ Operation humidity : 100% maximum (Non-condensing)

➔ Storage humidity : 100% (Non-condensing)

■ **Standard Pack Accessories**

➔ Air Force One 5	x 1
➔ Quick Installation Guide	x 1 (English/Spanish)
➔ CD-ROM (with User Manual and QIG)	x 1
➔ Power Adapter DC24V 0.5A	x 1
➔ POE injector	x1
➔ Mounting Kit	x2

Chapter 2. Base Installation

2.1 Hardware Installation

2.1.1 Package Contents

- Air Force One 5 x 1
- Quick Installation Guide x 1
- CD-ROM (with User Manual and QIG) x 1
- Power Adapter x 1
- POE injector x1
- Mounting Kit x 2

It is highly recommended to use all the supplies in the package instead of substituting any components by other suppliers to guarantee best performance.

2.1.2 Panel Function Descriptions

AIR FORCE ONE 5

Front Panel

Rear Panel

1. Reboot Button : Unscrew the screw and click Reset button to restart system or reset to default configurations.

   ➔ Press and hold the Reset button for 2 seconds to restart system. The LED except Power indicator will be off before restarting.

   ➔ Press and hold the Reset button for more than 10 seconds to reset the system to default configurations.

2. Power : Green LED ON indicates power on, and OFF indicates power off.

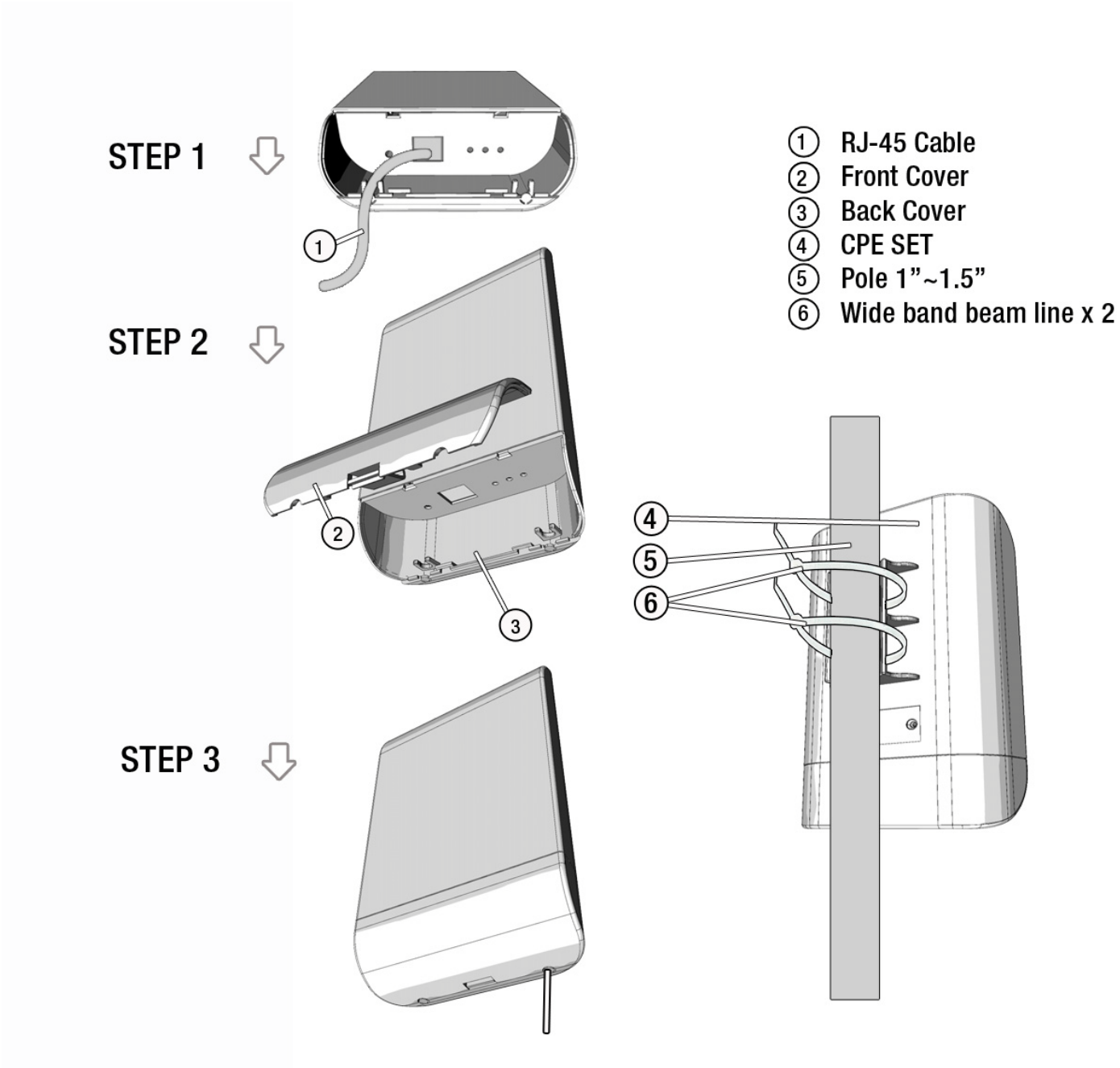
3. WLAN : Green LED FLASH indicates Wireless Transmit.

4. Ethernet : Green LED ON indicates connection, OFF indicates no connection

5. PoE RJ45 port : For connecting PoE LAN cable

2.1.3 Hardware Installation Steps

Please follow the steps mentioned below to install the hardware of "Air Force One 5" :



2.2 Web Management Interface Instructions

"Air Force One 5" supports web-based configuration. Upon the completion of hardware installation, "Air Force One 5" can be configured through a PC/NB by using its web browser such as Internet Explorer version 6.0.

- **Default IP Address :** 192.168.2.254
- **Default IP Netmask :** 255.255.255.0
- **Default User Name and Password :**

  The default user name and password for both root manager account and admin manager account are as follows :

Manager Account	Root Account	Admin Account
User name	root	admin
Password	default	admin

Step

- **IP Segment Set-up for Administrator's PC/NB**

  Set the IP segment of the administrator's computer to be in the same range as "Air Force One 5" for accessing the system. Do not duplicate the IP Address used here with IP Address of "Air Force One 5" or any other device within the network

  Example of Segment :

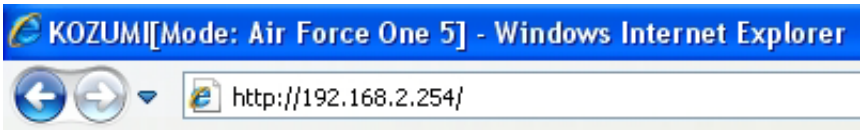
  The value for underlined area can be changed as desired; the valid range is 1 ~ 254. However, 254 shall be avoided as it is already used by "Air Force One 5"; use 10 as an example here.

  ➔ IP Address : 192.168.2.10

  ➔ IP Netmask : 255.255.255.0

- **Launch Web Browser**

  Launch as web browser to access the web management interface of system by entering the default IP Address, http://192.168.2.254, in the URL field, and then press ***Enter***.



- **System Login**

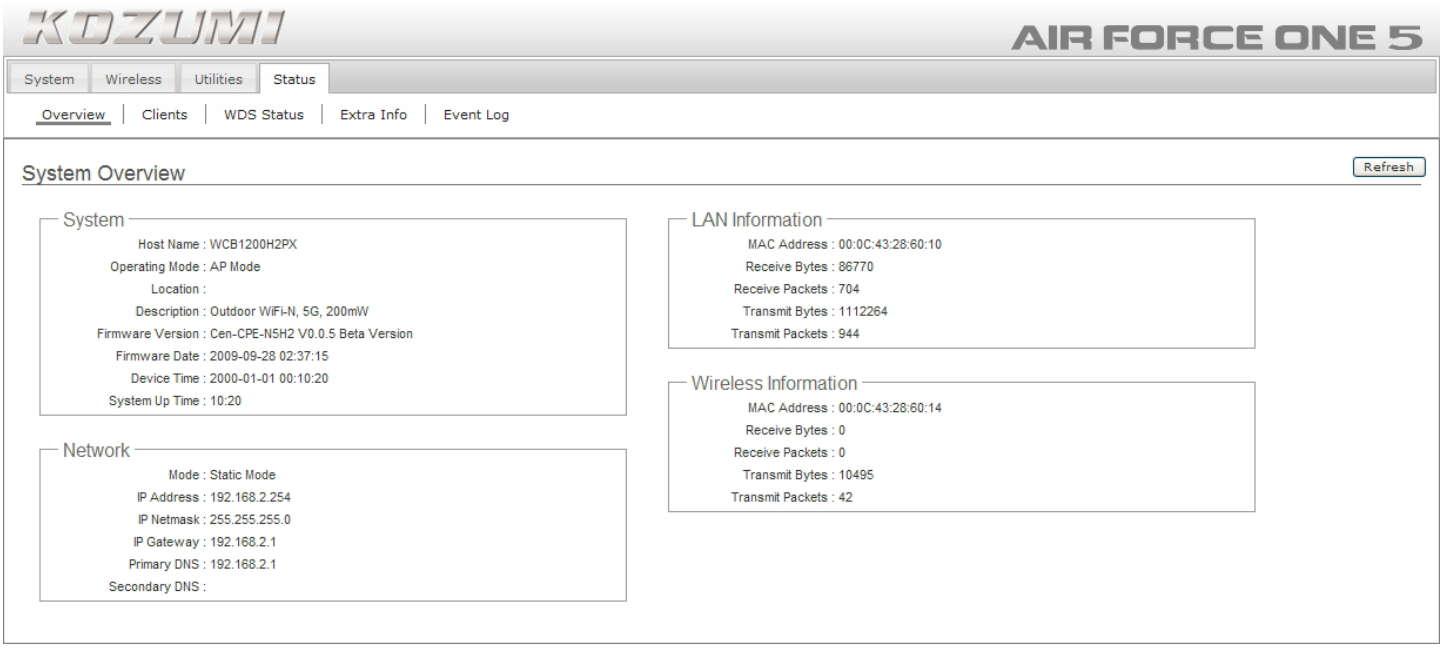
The system manager Login Page then appears.

Enter "***root***" as **User name** and "***default***" as **Password**, and then click OK to login to the system; the root manager account is used as an example here.

Connect to 192.168.2.254
The server 192.168.2.254 at WCB1200H2PX requires a username and password.
Warning: This server is requesting that your username and password be sent in an insecure manner (basic authentication without a secure connection).
User name:
root
Password:
Remember my password
OK
Cancel

- **Login Success**

System Overview page will appear after successful login.


KOZUMI
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System
Wireless
Utilities
Status
Overview
Clients
WDS Status
Extra Info
Event Log
System Overview
Refresh
System
Host Name : WCB1200H2PX
Operating Mode : AP Mode
Location :
Description : Outdoor WiFi-N, 5G, 200mW
Firmware Version : Cen-CPE-N5H2 V0.0.5 Beta Version
Firmware Date : 2009-09-28 02:37:15
Device Time : 2000-01-01 00:10:20
System Up Time : 10:20
Network
Mode : Static Mode
IP Address : 192.168.2.254
IP Netmask : 255.255.255.0
IP Gateway : 192.168.2.1
Primary DNS : 192.168.2.1
Secondary DNS :
LAN Information
MAC Address : 00:0C:43:28:60:10
Receive Bytes : 86770
Receive Packets : 704
Transmit Bytes : 1112264
Transmit Packets : 944
Wireless Information
MAC Address : 00:0C:43:28:60:14
Receive Bytes : 0
Receive Packets : 0
Transmit Bytes : 10495
Transmit Packets : 42

2.3 Applications in Wireless Network

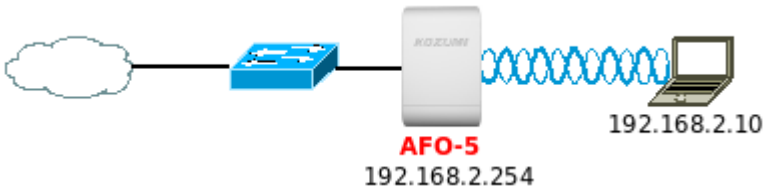
Air Force One 5 is a multiple mode system which can be configured either as a wireless gateway or an access point as desired. It also can be used as WDS link for network extension This section depicts different applications in AP Mode, WDS Mode, CPE Mode and Universal Repeater Mode.

- Configuration in AP Mode (Access Point + WDS)

  An access point can be either a main, relay or remote base station. A main base station is typically connected to the wired Ethernet. A relay base station relays data between remote base stations, wireless clients or other relay stations to either a main or another relay base station. A remote base station accepts connections from wireless clients and passes them on to relay or main stations

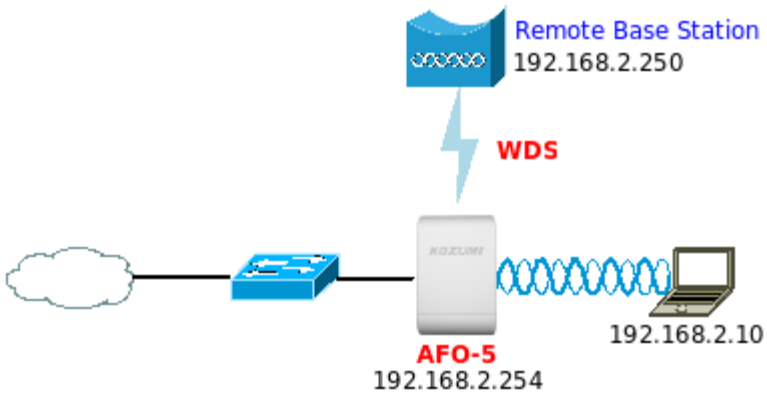
  ➔ **Example 1 :** Access Point without WDS

  ✓ It can be deployed as a tradition fixed wireless Access Point



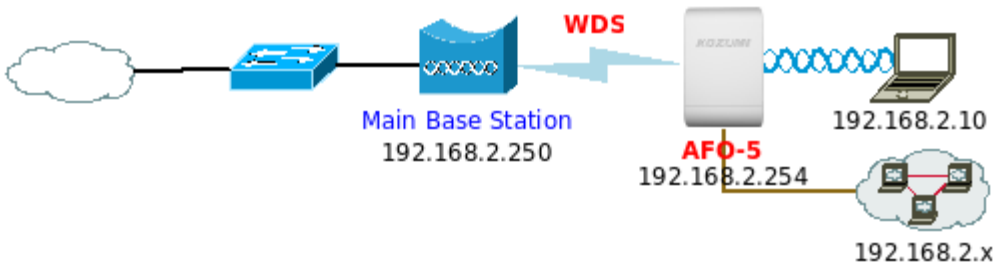
  ➔ **Example 2 :** Access Point with WDS

  ✓ It can be deployed as a tradition fixed wireless Access Point and provides WDS link for network extension



➔ **Example 3 :** Wireless Repeater Bridge

✓ It may also be refereed to as a wireless repeater mode because it appears to bridge and accept wireless clients simultaneously (unlike traditional bridging). Please noted, throughput under this setting is halved for all clients connected wirelessly.

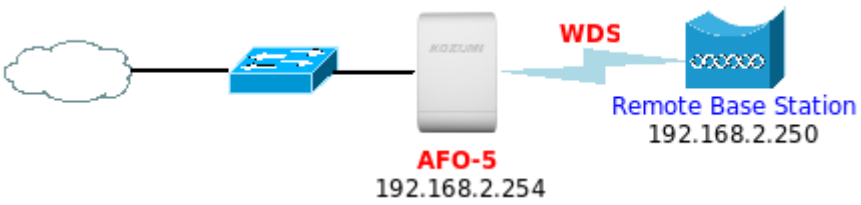


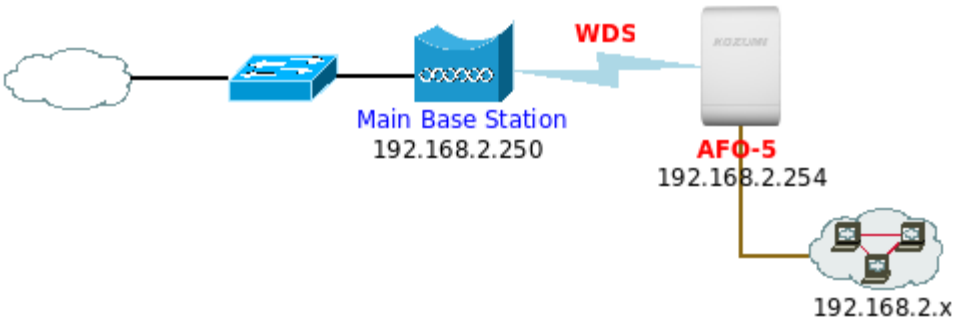
■ Configuration in WDS Mode (Pure WDS)

An access point can be either a main, relay or remote base station. A main base station is typically connected to the wired Ethernet. A relay base station relays data between remote base stations or other relay stations to either a main or another relay base station. In this mode, it can only provide WDS link and wireless clients **cannot** access

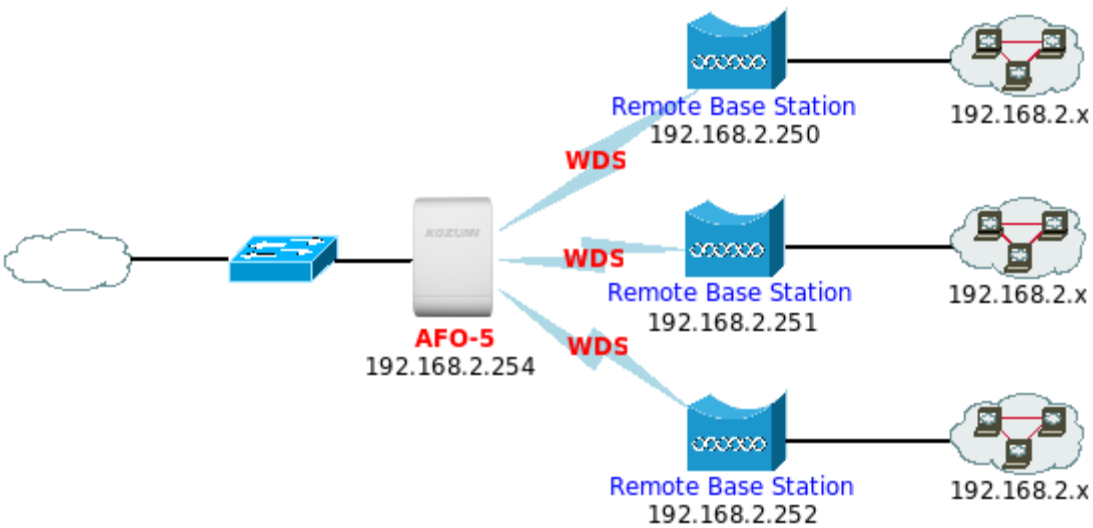
simultaneously.

➔ **Example 1 :** Point-to-Point

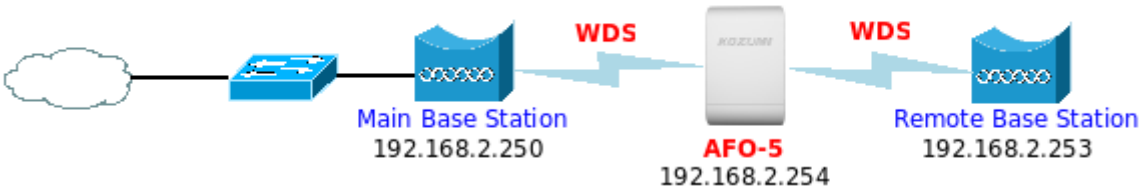




➔ **Example 2 :** Point-to-Multi-Point

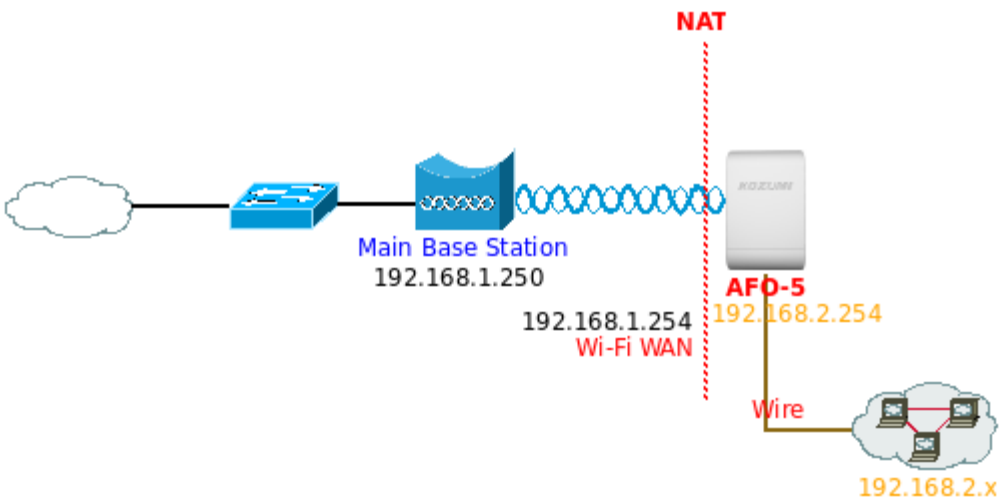


➔ **Example 3 :** Repeater



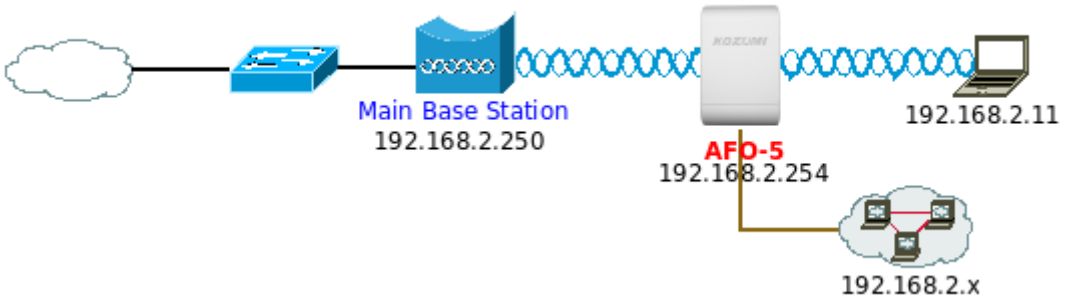
- **Configuration in CPE Mode (Router Client)**

It can be used as an Outdoor Customer Premises Equipment (CPE) to receive wireless signal over last mile applications, helping WISPs deliver wireless broadband Internet service to new residential and business customers. In this mode, the AFO-5 is a gateway with NAT and DHCP Server functions. The wired clients of AFO-5 are in **different** subnet from Main Base Station and it **does not** accept wireless connections from client devices.



■ Configuration in Universal Repeater Mode

It can be used as an Universal Repeater to receive wireless signal over last mile applications, helping WISPs deliver wireless broadband Internet service to new residential and business customers. In this mode, the wired clients of AFO-5 are in **the same** subnet from Main Base Station and it **accepts** wireless connections from client devices.



Chapter 3. AP Mode Configuration

When AP mode is activated, the system can be configured as an Access Point. This section provides information for configuring the AP mode with graphical illustrations. "Air Force One 5" provides functions as stated below where it can be configured via a user-friendly web based interface.

Option	System	Wireless	Utilities	Status
Functions	Operating Mode	General Settings	Profiles Settings	System Overview
	LAN	Advanced Settings	Firmware Upgrade	Clients
	Management	Virtual AP	Network Utility	WDS Status
	Time Server	WDS Setup	Reboot	Extra Info
	UPNP			Event Log
	SNMP			

Table 3-1: AP Mode Functions

3.1 External Network Connection

3.1.1 Network Requirement

If you want to develop a wireless network to allow wireless clients or Stations (STA) to access wirelessly within the coverage area, in this mode, the “Air Force One 5” (AFO-5) connected directly to a wired LAN provides a connection point for wireless clients.

The first step is to get a Default Gateway IP Address from system manager and connect it to the LAN port of “Air Force One 5”. **Figure 3-1** shows Access Point on a Wired LAN Configuration

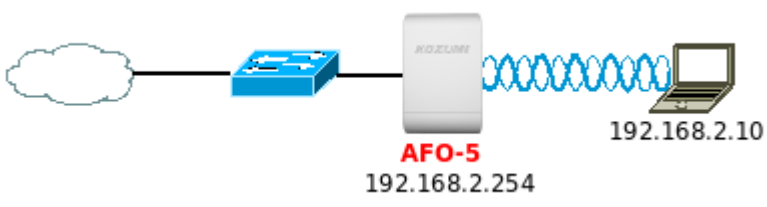
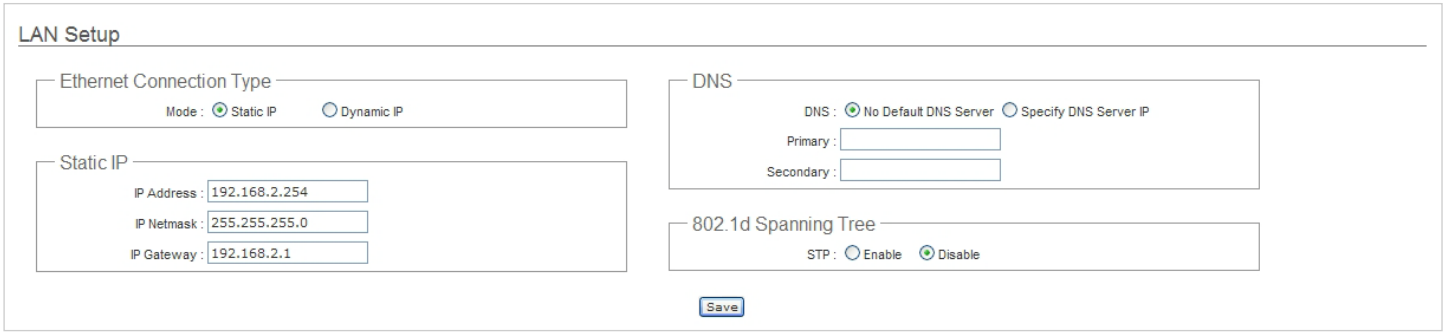


Figure 3-1 Access Point on a Wired LAN Configuration

3.1.2 Configuration LAN IP

Here are the instructions for how to setup the local IP Address and Netmask.

Please click on **System -> LAN** and follow the below setting.



- **Mode :** Check either “Static IP” or “Dynamic IP” button as desired to set up the system IP of LAN port .
  - ➔ **Static IP :** The administrator can manually setup the LAN IP address when static IP is available/ preferred.
  - ➔ **IP Address :** The IP address of the LAN port; default IP address is 192.168.2.254
  - ➔ **IP Netmask :** The Subnet mask of the LAN port; default Netmask is 255.255.255.0
  - ➔ **IP Gateway :** The default gateway of the LAN port; default Gateway is 192.168.2.1
  - ➔ **Dynamic IP :** This configuration type is applicable when the "Air Force One 5" is connected to a network with the presence of a DHCP server; all related IP information will be provided by the DHCP server automatically.

  - ➔ **Hostname :** The Hostname of the LAN port

- **DNS :** Check either “No Default DNS Server” or “Specify DNS Server IP” button as desired to set up the system DNS.
  - ➔ **Primary :** The IP address of the primary DNS server.
  - ➔ **Secondary :** The IP address of the secondary DNS server.

- **802.1d Spanning Tree**

  The spanning tree network protocol provides a loop free topology for any bridged LAN. The Spanning Tree Protocol, which is also referred to as STP, is defined in the IEEE Standard 802.1d.

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes

3.2 Wireless LAN Network Creation

The system manager can configure related wireless settings, **General Settings, Advanced Settings, Virtual AP Setting, Security Settings,** and **Access Control Settings**.

3.2.1 Wireless General Setup

The administrator can change the data transmission, channel and output power settings for the system. Please click on **Wireless -> General Setup** and follow the below setting.

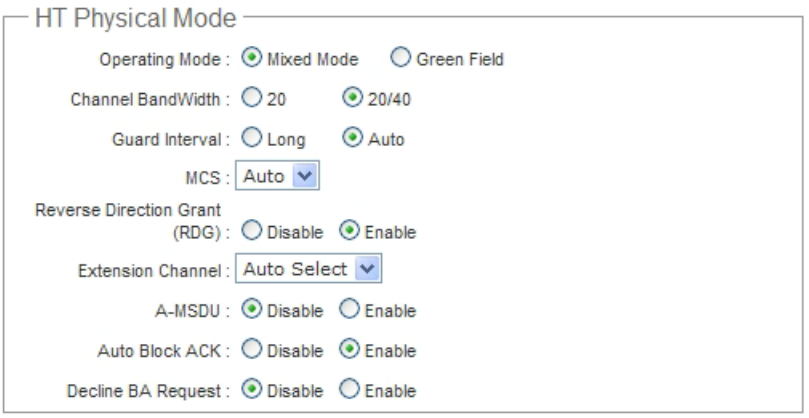
- **MAC address :** The MAC address of the Wireless interface is displayed here.
- **Band Mode :** Select an appropriate wireless band; bands available are **801.11a** or **802.11a/n mixed mode**.
- **Client Isolation :** Select **Enable**, all clients will be isolated from each other, that means all clients cannot reach to other clients.
- **Transmit Rate Control :** Select the desired rate from the drop-down list; the options are auto or ranging from 1 to 54Mbps only for **802.11a** mode.
- **Country :** Select the desired country code from the drop-down list; the options are ***US***, ***ETSI***, ***JP*** and ***NONE***.
- **Channel :** The channel range will be changed by selecting different country code. Below depicts the channel range for different ***Country***.

Country	Channel
US	36, 40, 44, 48, 52, 56, 60, 64, 149, 153, 157, 161
ETSI	36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140
JA	36, 40, 44, 48
NONE	36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 149, 153, 157, 161

- **Tx Power :** You can adjust the output power of the system to get the appropriate coverage for your wireless network. Specify digit numbers between ***1*** to ***100*** (the unit is %) for your environment. If you are not sure which setting to choose, then keep the default setting, 100%.

When **Band Mode** select in **802.11a/n mixed mode**, the **HT(High Throughput)** settings should be shown-up immediately.

- **HT TxStream/RxStream :** Select 1 or 2 from the drop-down list


HT Physical Mode
Operating Mode : Mixed Mode Green Field
Channel BandWidth : 20 20/40
Guard Interval : Long Auto
MCS : Auto
Reverse Direction Grant (RDG) : Disable Enable
Extension Channel : Auto Select
A-MSDU : Disable Enable
Auto Block ACK : Disable Enable
Decline BA Request : Disable Enable

- **Operating Mode :**

  ➔ **Mixed Mode :** In this mode packets are transmitted with a preamble compatible with the legacy 802.11a/g, the rest of the packet has a new format. In this mode the receiver shall be able to decode both the Mixed Mode packets and legacy packets.

  ➔ **Green Field :** In this mode high throughput packets are transmitted without a legacy compatible part.

- **Channel Bandwidth :** The "**20/40**" MHz option is usually best. The other option is available for special circumstances.
- **Guard Interval :** Using "**Auto**" option can increase throughput. However, it can also increase error rate in some installations, due to increased sensitivity to radio-frequency reflections. Select the option that works best for your installation.
- **MCS :** This parameter represents transmission rate. By default (Auto) the fastest possible transmission rate will be selected. You have the option of selecting the speed if necessary.
- **Reverse Direction Grant(RDG) :** Disable or enable reserve direction grant. Default is enabled.
- **Extension Channel :** When "20/40" channel bandwidth has been chosen, you should select extension channel to get higher throughput.
- **A-MSDU : Aggregated** Mac Service Data Unit. Select **Enable** to allow aggregation for multiple MSDUs in one MPDU Default is disabled.
- **Auto Block ACK :** Disable or enable auto block ACK. Default is enabled.
- **Decline BA Request :** Disable or enable decline BA request. Default is disabled.

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes. The items in this page are for AP's RF general settings and will be applied to all VAPs.

3.2.2 Wireless Advanced Setup

The administrator can change the RTS threshold and fragmentation threshold settings for the system. Please click on

Wireless Setup
Advanced Setup
Beacon Interval : 100 ms
Data Beacon Rate(DTIM) : 1 ms
Fragment Threshold : 2346
RTS Threshold : 2347
Short Preamble : Enable Disable
Short Slot : Enable Disable
Tx Burst : Enable Disable
Pkt_Aggregate : Enable Disable
IEEE 802.11H : Enable Disable
WMM Capable : Enable Disable
Save

Wireless -> Advanced Setup and follow the below setting.

- **Beacon Interval :** Enter a value between **20** and **1024** msec. The default value is **100** milliseconds. The entered time means how often the beacon signal transmission between the access point and the wireless network.
- **DTIM Interval :** A DTIM is a countdown informing clients of the next window for listening to broadcast and multicast messages. When the wireless router has buffered broadcast or multicast messages for associated clients, it sends the next DTIM with a DTIM Interval value. Wireless clients detect the beacons and awaken to receive the broadcast and multicast messages. The default value is 1. Valid settings are between **1** and **255**.
- **Fragment Threshold :** The value specifies the maximum size of packet allowed before data is fragmented into multiple packets. Please use this value to tune the wireless connection if lots of retransmission happens. Enter a value ranging from **256** to **2346**.
- **RTS Threshold :** Tuning the Request to Send, RTS threshold will help the system control its access to medium and alleviate the hidden node problem. Enter a value ranging from **1** to **2347**.
- **Short Preamble :** The short preamble provides 56-bit Synchronization field to improve WLAN transmission efficiency. Check ***Enable*** button for using Short Preamble, and ***Disable*** for using the Long Preamble, 128-bit Synchronization field, option.
- **Short Slot :** Enable or disable short slot. Default is enabled.
- **Tx Burst :** Click ***Enable*** button to activate Tx Burst, and ***Disable*** to deactivate Tx Burst. Enable the Tx Burst can

increase transmission throughput.

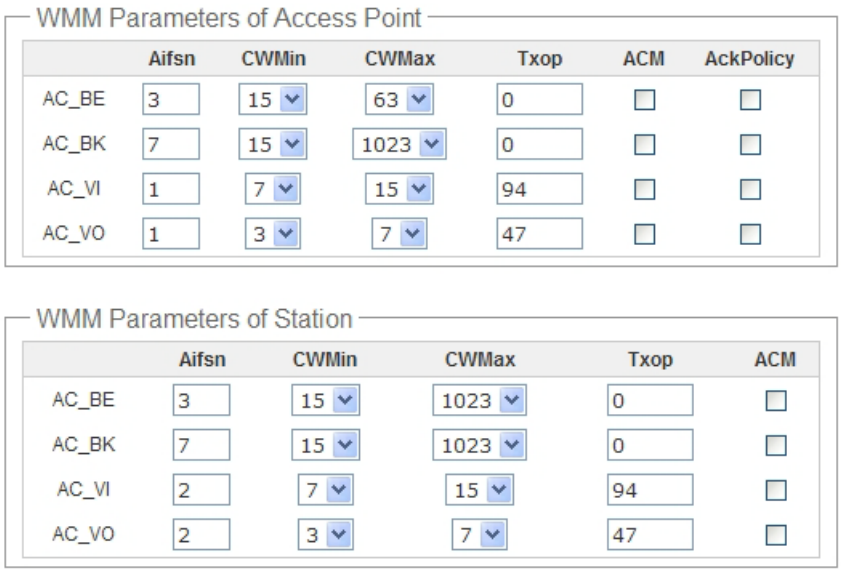
- **Pkt_Aggregate :** Increase efficiency by aggregating multiple packets of application data into a single transmission frame. In this way, 802.11n networks can send multiple data packets with the fixed overhead cost of just a single frame.

- **IEEE802.11H :** Select Enable to enable DFS(Dynamic Frequency Selection). Default is Enable. When a DFS-enabled radio is operating on one of the following channels, the wireless device uses DFS to monitor the operating frequency and switch to another frequency or reduce power as necessary:

DFS Channels	52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 136, 140

The maximum legal transmit power is greater for some 5 GHz channels than for others. When the wireless device randomly selects a 5 GHz channel on which power is restricted, the wireless device automatically reduces transmit power to comply with power limits for that channel in that regulatory domain.

- **WMM Capable :** Select Enable, the configuration field of WMM parameters should appear.


WMM Parameters of Access Point
Aifsn CWMin CWMax Txop ACM AckPolicy
AC_BE 3 15 63 0
AC_BK 7 15 1023 0
AC_VI 1 7 15 94
AC_VO 1 3 7 47
WMM Parameters of Station
Aifsn CWMin CWMax Txop ACM
AC_BE 3 15 1023 0
AC_BK 7 15 1023 0
AC_VI 2 7 15 94
AC_VO 2 3 7 47

When you enable WMM Capable, the "Tx Burst" will be Disabled automatically by system.

➔ **WMM Parameters of Access Point :** *This affects traffic flowing from the access point to the client station*

Queue	Data Transmitted AP to Clients	Priority	Description
AC_BK	Background.	Low	High throughput. Bulk data that requires maximum throughput and is not time-sensitive is sent to this queue (FTP data, for example).
AC_BE	Best Effort	Medium	Medium throughput and delay. Most traditional IP data is sent to this queue
AC_VI	Video	High	Minimum delay. Time-sensitive video data is automatically sent to this queue
AC_VO	Voice	High	Time-sensitive data like VoIP and streaming media are automatically sent to this queue

Configuring QoS options consists of setting parameters on existing queues for different types of wireless traffic. You can configure different minimum and maximum wait times for the transmission of packets in each queue based on the requirements of the media being sent. Queues automatically provide minimum transmission delay for Voice, Video, multimedia, and mission critical applications, and rely on best-effort parameters for traditional IP data.

As an Example, time-sensitive Voice & Video, and multimedia are given effectively higher priority for transmission (lower wait times for channel access), while other applications and traditional IP data which are less time-sensitive but often more data-intensive are expected to tolerate longer wait times.

- ✓ **Aifsn** : The Arbitration Inter-Frame Spacing Number specifies a wait time (in milliseconds) for data frames
- ✓ **CWmin** : Minimum Contention Window. This parameter is input to the algorithm that determines the initial random backoff wait time ("window") for retry of a transmission. The value specified here in the Minimum Contention Window is the upper limit (in milliseconds) of a range from which the initial random backoff wait time is determined.
- ✓ **CWmax** : Maximum Contention Window. The value specified here in the Maximum Contention Window is the upper limit (in milliseconds) for the doubling of the random backoff value. This doubling continues until either the data frame is sent or the Maximum Contention Window size is reached. Once the Maximum Contention Window size is reached, retries will continue until a maximum number of retries allowed is reached. Valid values for the "cwmax" are 1, 3, 7, 15, 31, 63, 127, 255, 511, or 1024. The value for "cwmax" must be higher than the value for "cwmin".
- ✓ **Txop** : Transmission Opportunity is an interval of time when a WME AP has the right to initiate

transmissions onto the wireless medium (WM). This value specifies (in milliseconds) the Transmission Opportunity (TXOP) for AP; that is, the interval of time when the WMM AP has the right to initiate transmissions on the wireless network.

- ✓ **ACM :** Admission Control Mandatory, ACM only takes effect on AC_VI and AC_VO. When you do not click Checkbox, it means that the ACM is controlled by the connecting AP. If you click Checkbox, it means that the Client is in charge.
- ✓ **AckPolicy :** Acknowledgment Policy, WMM defines two ACK policies: **Normal ACK** and **No ACK**. Click "**Checkbox**" indicates "**No ACK**"

  When the no acknowledgement (No ACK) policy is used, the recipient does not acknowledge received packets during wireless packet exchange. This policy is suitable in the environment where communication quality is fine and interference is weak. While the No ACK policy helps improve transmission efficiency, it can cause increased packet loss when communication quality deteriorates. This is because when this policy is used, a sender does not retransmit packets that have not been received by the recipient.

  When the Normal ACK policy is used, the recipient acknowledges each received unicast packet.

➔ **WMM Parameters of Station :** *This affects traffic flowing from the client station to the access point.*

Queue	Data Transmitted Clients to AP	Priority	Description
AC_BK	Background.	Low	High throughput. Bulk data that requires maximum throughput and is not time-sensitive is sent to this queue (FTP data, for example).
AC_BE	Best Effort	Medium	Medium throughput and delay. Most traditional IP data is sent to this queue
AC_VI	Video	High	Minimum delay. Time-sensitive video data is automatically sent to this queue
AC_VO	Voice	High	Time-sensitive data like VoIP and streaming media are automatically sent to this queue

- ✓ **Aifsn** : The Arbitration Inter-Frame Spacing Number specifies a wait time (in milliseconds) for data frames
- ✓ **CWmin** : Minimum Contention Window. This parameter is input to the algorithm that determines the initial random backoff wait time ("window") for retry of a transmission. The value specified here in the Minimum Contention Window is the upper limit (in milliseconds) of a range from which the initial random backoff wait time is determined.
- ✓ **CWmax** : Maximum Contention Window. The value specified here in the Maximum Contention Window is

the upper limit (in milliseconds) for the doubling of the random backoff value. This doubling continues until either the data frame is sent or the Maximum Contention Window size is reached. Once the Maximum Contention Window size is reached, retries will continue until a maximum number of retries allowed is reached. Valid values for the "cwmax" are 1, 3, 7, 15, 31, 63, 127, 255, 511, or 1024. The value for "cwmax" must be higher than the value for "cwmin".

- ✓ **Txop** : Transmission Opportunity is an interval of time when a WME AP has the right to initiate transmissions onto the wireless medium (WM). This value specifies (in milliseconds) the Transmission Opportunity (Txop) for AP; that is, the interval of time when the WMM AP has the right to initiate transmissions on the wireless network.
- ✓ **ACM :** Admission Control Mandatory, ACM only takes effect on AC_VI and AC_VO. When you do not click Checkbox, it means that the ACM is controlled by the connecting AP. If you click Checkbox, it means that the Client is in charge.

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes. The items in this page are for AP's RF advanced settings and will be applied to all VAPs.

3.2.3 Create Virtual AP

The “Air Force One 5” support broadcasting multiple SSIDs, allowing the creation of Virtual Access Points, partitioning a single physical access point into **8** logical access points, each of which can have a different set of security, VLAN tag(ID) and network settings. **Figure 3-2** shows multiple SSIDs with different security type and vlan settings.

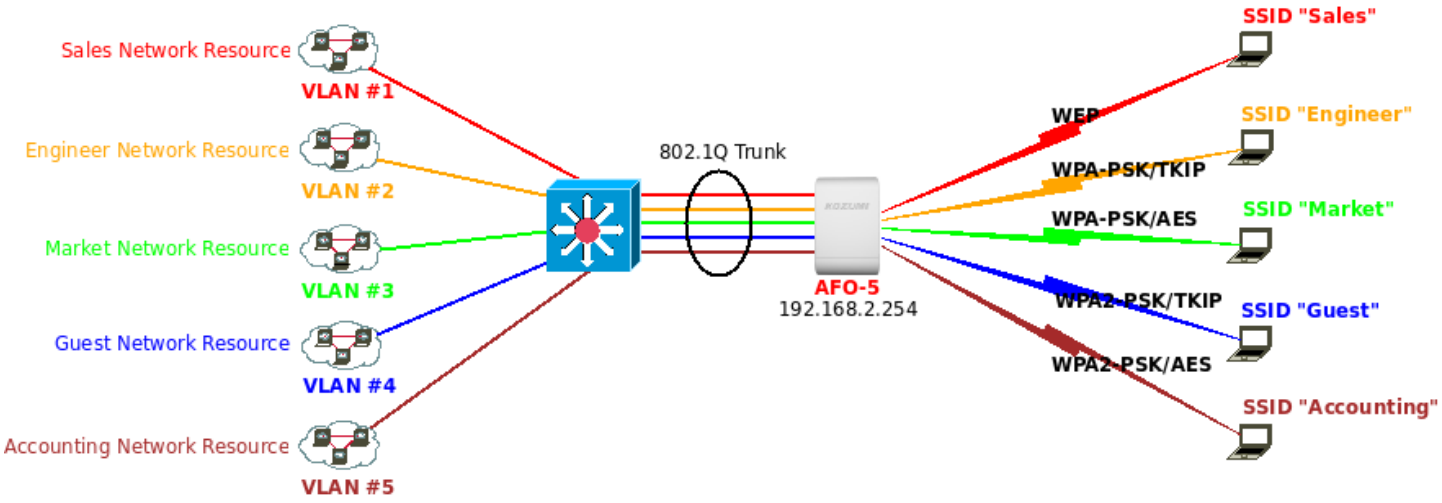


Figure 3-2 Multiple SSIDs with different Security Type and VLAN Tag

3.2.3.1 Virtual AP Overview

The administrator can view all of the Virtual AP's settings via this page.

Please click on **Wireless -> Virtual AP Setup** and the Virtual AP Overview Page appears.

Virtual AP Overview
VAP List
VAP ESSID Status Security Type MAC ACL Edit
Primary AP Main_AP ON None Disable Edit
VAP1 OFF None Disable Edit
VAP2 OFF None Disable Edit
VAP3 OFF None Disable Edit
VAP4 OFF None Disable Edit
VAP5 OFF None Disable Edit
VAP6 OFF None Disable Edit
VAP7 OFF None Disable Edit

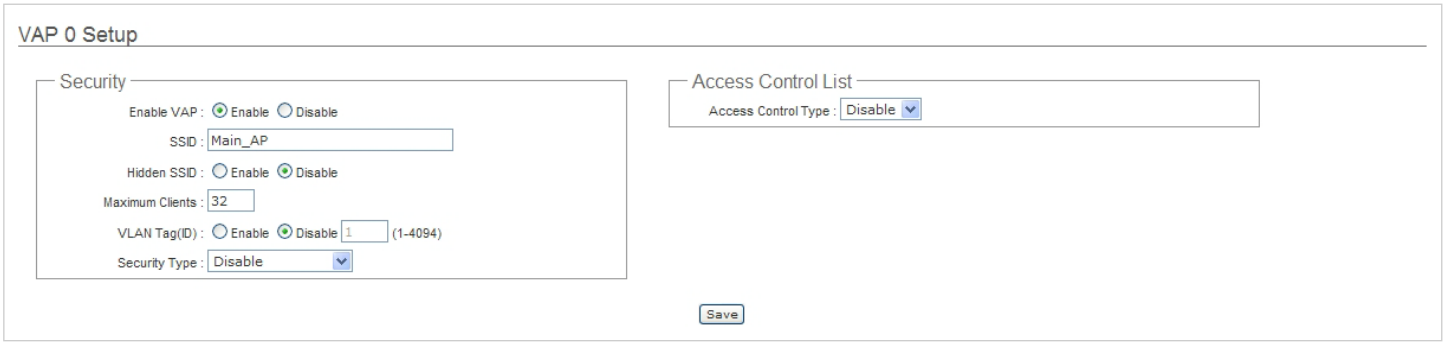
- **VAP :** Indicate the system's Virtual AP
- **ESSID :** Indicate the ESSID of the respective Virtual AP

- **Status :** Indicate the Status of the respective Virtual AP
- **Security Type :** Indicate the security type of the respective Virtual AP used.
- **MAC ACL :** Indicate the MAC ACL of the respective Virtual AP used.
- **Edit :** Click Edit button for configuring Virtual AP's settings, security type and ACL.

3.2.3.2 Virtual AP Setup

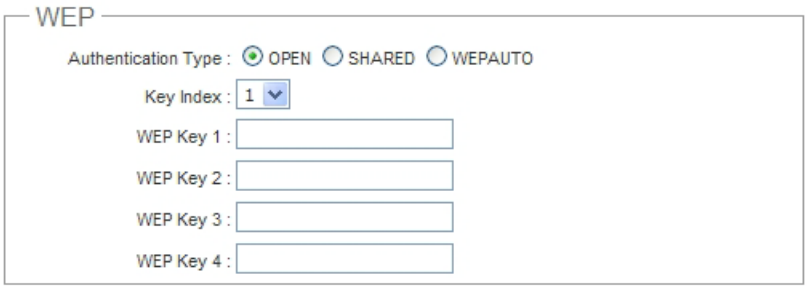
For each Virtual AP, administrators can configure SSID, VLAN tag(ID), SSID broadcasting, Maximum number of client associations, security type and Access Control List(ACL) settings.

Click **Edit** link on the VAP List, and then Virtual AP setup page appears.



- **Enable VAP :** Click “Enable” to activate VAP or click “Disable” to deactivate this function
- **SSID :** Service Set ID, ESSID will determine the service type of a client which is assigned to the specified VAP. When clients are browsing for available wireless networks, this is the SSID that will appear in the list.
- **Hidden SSID :** Select this option to enable the SSID to broadcast in your network. When configuring the network, it is suggested to enable this function but disable it when the configuration is complete. With this enabled, someone could easily obtain the SSID information with the site survey software and get unauthorized access to a private network. With this disabled, network security is enhanced and can prevent the SSID from being seen in the network.
- **Maximum Clients :** You can set the number of wireless clients that can associate via a particular SSID, Enter maximum number of clients to a desired number. For example, while the number of client is set to 5, only 5 clients are allowed to connect with this VAP. The default value is **32**
- **VLAN Tag(ID) :** Virtual LAN, the system supports tagged VLAN. To enable VLAN function; valid values are from **1** to **4094**. If your network uses VLANs, you can assign an SSID to VLAN1, and the access point groups client devices using that SSID into VLAN1. This enables the separation of wireless applications based on security.
- **Security Type :** Select the desired security type from the drop-down list; the options are **Disable**, **WEP**, **WPA-PSK**, **WPA2-PSK**, **WPA-Enterprise**, **WPA2-Enterprise** and **WEP 802.1X**.
  - ➔ **Disable :** Data are unencrypted during transmission when this option is selected.
  - ➔ **WEP :** WEP, Wired Equivalent Privacy, is a data encryption mechanism based on a 64-bit or 128-bit shared key.

Select ***WEP*** as the security type from the drop-down list as desired.

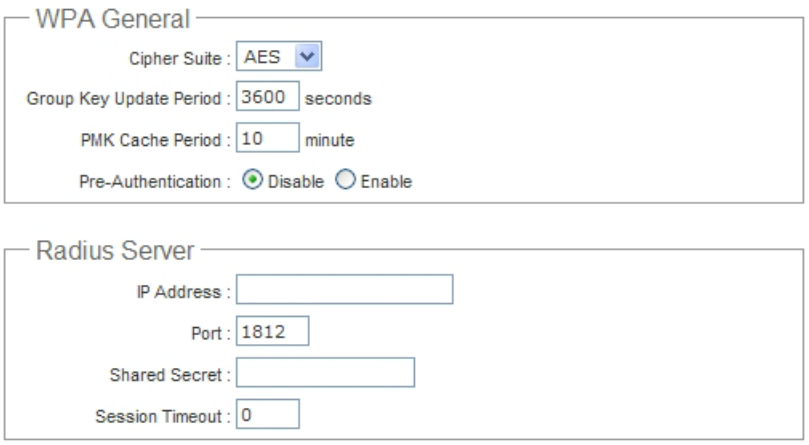


- ✓ **Authentication Method :** Enable the desire option among ***OPEN***, ***SHARED*** or ***WEPAUTO***.
- ✓ **Key Index :** Select key index used to designate the WEP key during data transmission. 4 different WEP keys can be configured at the same time, but only one is used. Effective key is set with a choice of WEP Key 1, 2, 3, or 4.
- ✓ **WEP Key # :** Enter **HEX(10 or 26)** or **ASCII(5 or 13)** format WEP key value; the system support up to 4 sets of WEP keys.

➔ **WPA-PSK (or WPA2-PSK) :** WPA (or WPA2) Algorithms, allows the system accessing the network by using the WPA-PSK protected access.

- ✓ **Cipher Suite :** Select the desired cipher suite from the drop-down list; the options are **AES** and **TKIP**
- ✓ **Pre-shared Key :** Enter the information for pre-shared key; the key can be either entered as a 256-bit secret in **64 HEX** digits format, or **8 to 63 ASCII** characters.
- ✓ **Group Key Update Period :** This time interval for e-keying GTK (broadcast/multicast encryption keys) in seconds. Enter the time-length required; the default time is **3600** seconds.

➔ **WPA-Enterprise (or WPA2-Enterprise):** The RADIUS authentication and encryption will be both enabled if this is selected.



✓ **WPA General Settings :**

- **Cipher Suite :** Select the desired cipher suite from the drop-down list; the options are **AES** and **TKIP**
- **Group Key Update Period :** This time interval for re-keying GTK (broadcast/ multicast encryption keys) in seconds. Enter the time-length required; the default time is **3600** seconds.
- **PMK Cache Period :** Pairwise Master Key, PMK. Set **WPA2** PMKID cache timeout period, after time out, the cached key will be deleted.
- **Pre-Authentication :** Set WPA2 pre-authentication mode. This is used to speed up roaming before pre-authenticating IEEE 802.1X/EAP part of the full RSN authentication and key handshake before actually associating with a new AP. Default is disable.

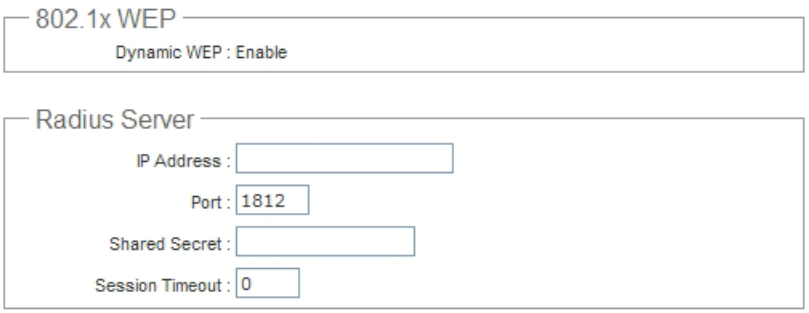
✓ **RADIUS Server Settings :**

- **IP Address :** Enter the IP address of the Authentication RADIUS server.
- **Port :** The port number used by Authentication RADIUS server. Use the default 1812 or enter port

number specified.

- **Shared secret :** The secret key for system to communicate with Authentication RADIUS server. Support **8 to 64 characters**.
- **Session Timeout :** Amount of time before a client will be required to re-authenticate. The Session Timeout unit is seconds and must be larger than **60** ; **0** is disable re-authenticate service.

➔ **WEP 802.1X :** When WEP 802.1x Authentication is enabled, please refer to the following settings to complete the configuration.



✓ **Radius Server Settings :**

- **IP Address :** Enter the IP address of the Authentication RADIUS server.
- **Port :** The port number used by Authentication RADIUS server. Use the default 1812 or enter port number specified.
- **Shared secret :** The secret key for system to communicate with Authentication RADIUS server. Support **8 to 64 characters**.
- **Session Timeout :** Amount of time before a client will be required to re-authenticate. The Session Timeout unit is seconds and must be larger than **60** ; **0** is disable re-authenticate service.

3.2.4 Black Wireless Clients

Continue **3.2.3.2 Virtual AP Setup** section. For each Virtual AP setting, the administrator can allow or reject clients to access each Virtual AP.

- **Access Control Type :** Select the desired access control type from the drop-down list; the options are **Disable**, **Allow** or **Reject**..

  There are two ways to set the Access Control List :

  ➔ **Access Control Type** is set to **Allow**.

  The wireless clients in the "**Enable**" list which will be **allowed** access to the Access Point; in the other word, the wireless clients in the "**Disable**" list will be **denied** access to the Access Point

  ➔ **Access Control Type** is set to **Reject**.

  The wireless clients in the "**Enable**" list which will **denied** access to the Access Point; in the other word, the wireless clients in the "**Disable**" list will be **granted** access to the Access Point.

- **Add a station MAC :** Enter MAC address in this field (e.g. aa:bb:cc:00:00:0a) and click "**Add**" button, then the MAC address should be display on "**Enable**" list

There are a maximum of **20** clients allowed in this MAC address list. The MAC addresses of the wireless clients can be added and removed to the list using the **Add** and **Remove** buttons.

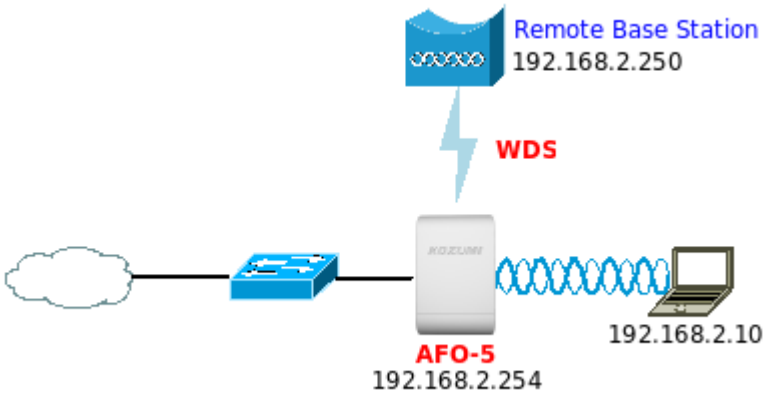
Click ***Reboot*** button to activate your changes

MAC Access Control is the weakest security approach. WPA or WPA2 security methods should be used when possible.

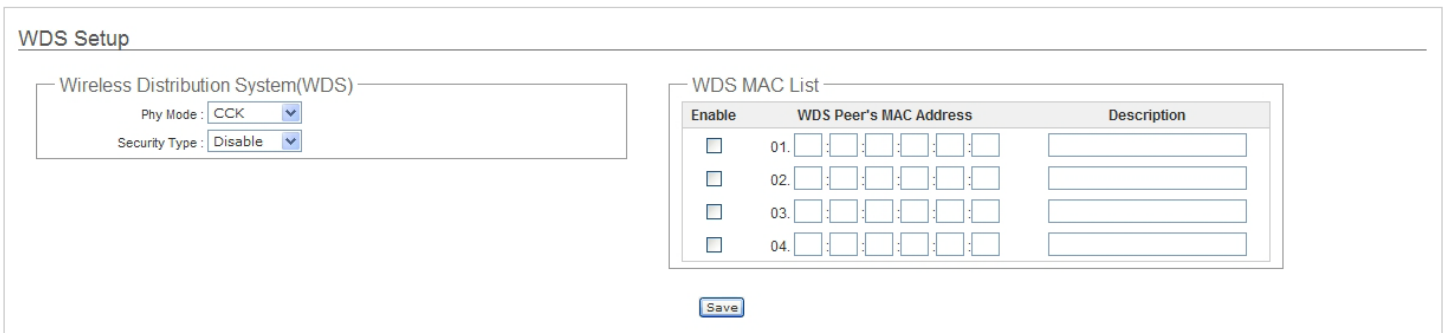
3.3 Wireless Network Expansion

The administrator can create WDS Links for expanding wireless network via this page. When WDS is enabled, this access point functions as a wireless bridge and is able to wirelessly communicate with other access points via WDS links.

A WDS link is bidirectional; both end points must support WDS and each access point must know the MAC Address of the other. Each access point will be configured with the remote access point's MAC address and vice versa. Make sure all access points are configured with the same channel and security type settings.



Please click on **Wireless -> WDS Setup** and follow the below setting.



- **Phy Mode :** Select Phy mode for Multicast frames. The Phy mode can be selected in “**CCK**”, “**OFDM**”, “**HTMIX**” and

"**GREENFIELD**" from drop-down list. The "**HTMIX**" and "**GREENFIELD**" option is only for **802.11a/n mixed mode**

- **Security Type :** Configure an appropriate security type for the WDS link, the Security Type can be select in "**Disable**", "**WEP**", "**AES**" or "**TKIP**" from drop-down list; the type needs to be the same as that configured on WDS peer.

  ➔ **WEP Key :** Enter **5 / 13 ASCII** or **10 / 26 HEX** format WEP key value.

  ➔ **TKIP Key :** Enter **8** to **63 ASCII** or **64 HEX** format TKIP key value.

  ➔ **AES Key :** Enter **8** to **63 ASCII** or **64 HEX** format AES key value.

- **WDS MAC List**

  ➔ **Enable :** Click ***Enable*** button to create WDS link.

  ➔ **WDS Peer's MAC Address :** Enter the MAC address of WDS peer.

  ➔ **Description :** Description of WDS link.

*The WDS link needs to be set at same **Channel** and **Security Type**.*

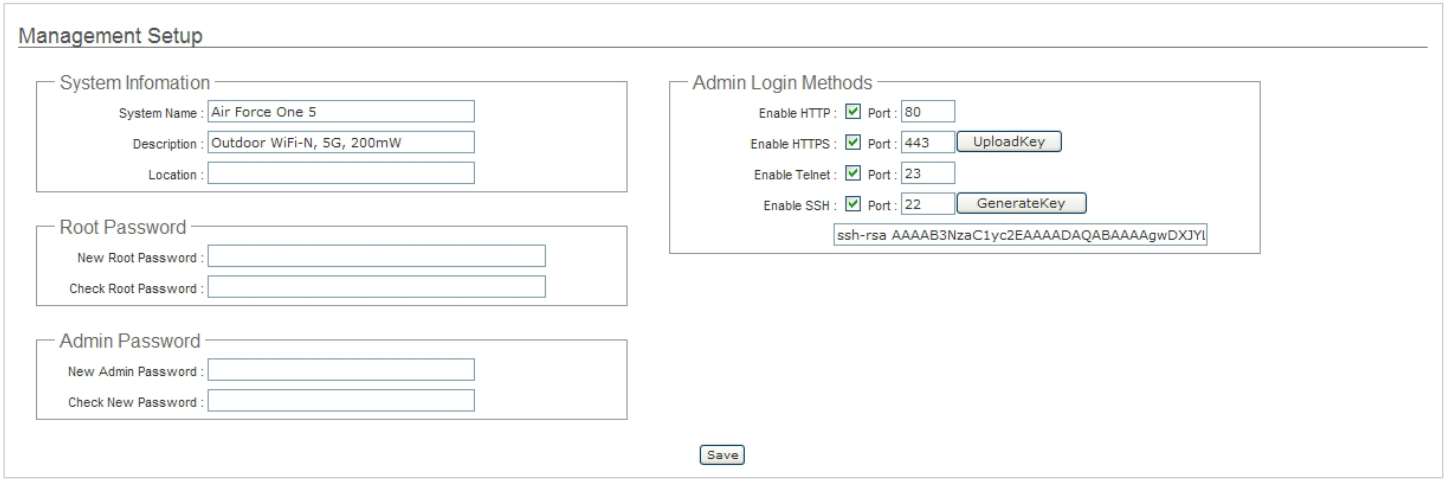
Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes

3.4 System Management

3.4.1 Configuration Management

The administrator can later obtain the geographical location of the system via the information configured here. The administrator also can change system password and configure system login methods.

Please click **System -> Management** and follow the below settings.



- **System Information**
  - ➔ **System Name :** Enter a desired name or use the default provided.
  - ➔ **Description :** Denote further information of the system.
  - ➔ **Location :** Enter related geographical location information of the system; administrator/manager will be able to locate the system easily.

The system supports **two** management accounts, root and admin. The system manager is assigned with full administrative privileges when logging in with the **root** account where the root manager can manage the system in any respect. However, when the system manager logs in via the **admin** account, only basic maintenance can be performed. Therefore, manager with different accounts will have different levels of privileges such as changing passwords; root manager can change passwords for both root account and admin account, however, admin manager can only maintain its own password. For more information on the respective privileges of these two management accounts, please refer to

Appendix C. System Manager Privileges.

- **Root Password :** The **root** manager can change its respective password. Enter the new password, and then verify the new password in the Check New Password filed. Click ***Save*** button to activate the new password.
  - ➔ **New Password :** Please input the new password of administrator.
  - ➔ **Check New Password :** Please input again the new password of administrator.
- **Admin Password :** The **admin** manager can change its respective password. Enter the new password, and then verify the new password in the Check New Password filed. Click ***Save*** button to activate the new password.
  - ➔ **New Password :** Please input the new password of administrator.
  - ➔ **Check New Password :** Please input again the new password of administrator.
- **Admin Login Methods :** The **root** manager can enable or disable system login methods, it can also change services port. Click ***Save*** button to activate the admin login methods.
  - ➔ **Enable HTTP :** Select Enable HTTP to activate HTTP Service
  - ➔ **HTTP Port :** Please input 1 ~ 65535 value to set HTTP Port; default value is 80
  - ➔ **Enable HTTPS :** Select Enable HTTPS to activate HTTPS Service
  - ➔ **HTTPS Port :** Please input 1 ~ 65535 value to set HTTPS Port; default value is 443

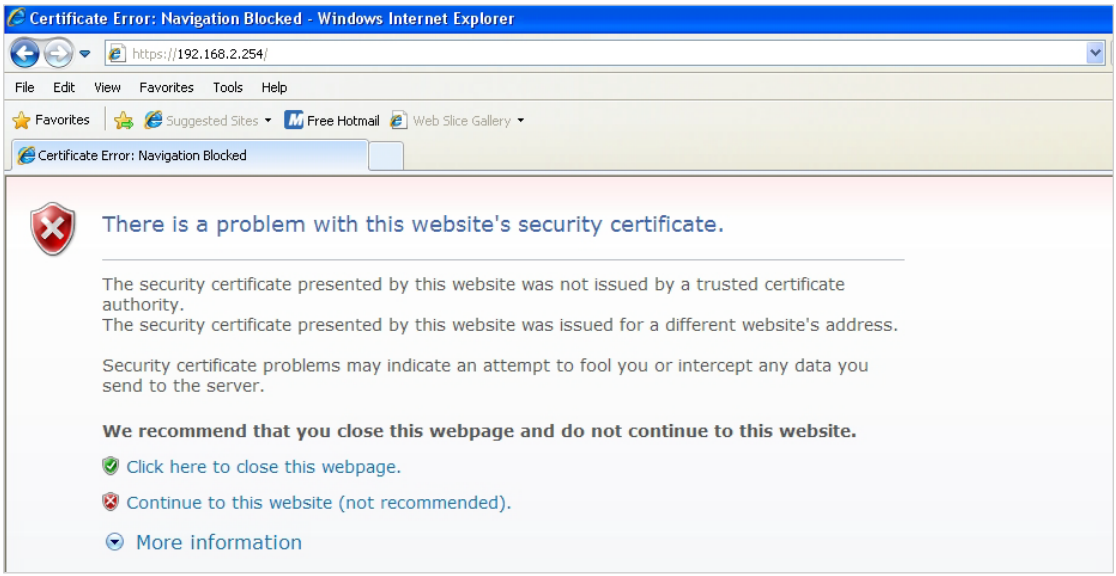
*If you already have an SSL Certificate, please click "**UploadKey**" button to select the file and upload it.*

  - ➔ **Enable Telnet :** Select Enable Telnet to activate Telnet Service
  - ➔ **Telnet Port :** Please input 1 ~ 65535 value to set Telnet Port; default value is 23
  - ➔ **Enable SSH :** Select Enable SSH to activate SSH Service
  - ➔ **SSH Port :** Please input 1 ~ 65535 value to set SSH Port; default value is 22

*Click "**GenerateKey**" button to generate RSA private key. The "Display the host key footprint" gray blank will be show content of RSA key.*

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes

Without a valid certificate, users may encounter the following problem in IE7 when they try to access system's WMI (https://192.168.2.254). There will be a “Certificate Error”, because the browser treats system as an illegal website.

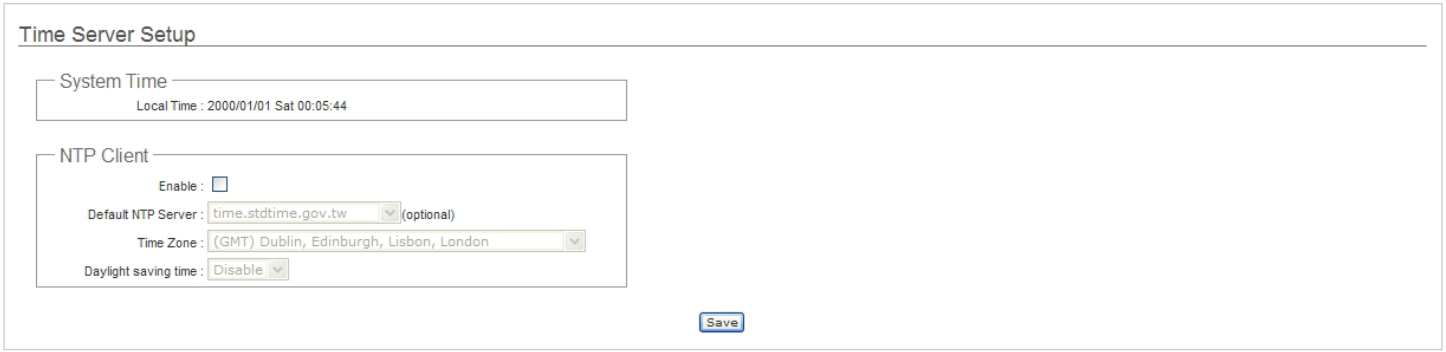

Certificate Error: Navigation Blocked - Windows Internet Explorer
https://192.168.2.254/
File Edit View Favorites Tools Help
Favorites
Suggested Sites
Free Hotmail
Web Slice Gallery
Certificate Error: Navigation Blocked
There is a problem with this website's security certificate.
The security certificate presented by this website was not issued by a trusted certificate authority.
The security certificate presented by this website was issued for a different website's address.
Security certificate problems may indicate an attempt to fool you or intercept any data you send to the server.
We recommend that you close this webpage and do not continue to this website.
Click here to close this webpage.
Continue to this website (not recommended).
More information

Click “***Continue to this website***” to access the system's WMI. The system's Overview page will appear.

3.4.2 Configure System Time

System time can be configured via this page where manual setting and NTP server configuration are both supported.

Please click on **System -> Time Server** and follow the below setting.



- **Local Time :** Display the current time of the system.

- **NTP Client :** Enable Network Time Protocol, NTP, to synchronize the system time with NTP server.

  ➔ **Default NTP Server :** Select the NTP Server from the drop-down list.

  ➔ **Time Zone :** Please set a time zone from where the accurate time can be supplied, **(GMT+08:00) Taipei** for example.

  ➔ **Daylight saving time :** Enable Daylight saving time from where the accurate time needed.

If the current time of the system is incorrect, please verify your network settings, like default Gateway and DNS settings

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes

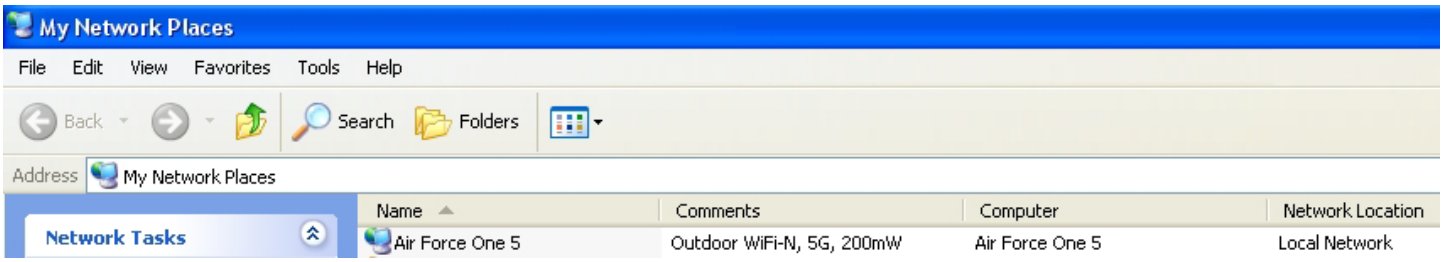
3.4.3 Configure UPnP

UPnP(Universal Plug and Play) is architecture for pervasive peer-to-peer network connectivity of PCs and intelligent devices or appliances, particularly within the home. UPnP builds on Internet standards and technologies, such as TCP/IP, HTTP, and XML, to enable these devices automatically connect with one another and work together to make networking – particularly home networking – possible for more people. Default: **Disable**.

- **UPnP :** Click "**Enable**" to activate UPnP Service or "**Disable**" to deactivate. The default is Disable.

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes

For UPnP to work in Windows XP, the "Air Force One 5" must be available in "***My Network Places***", as shown here: (your specific model may vary)

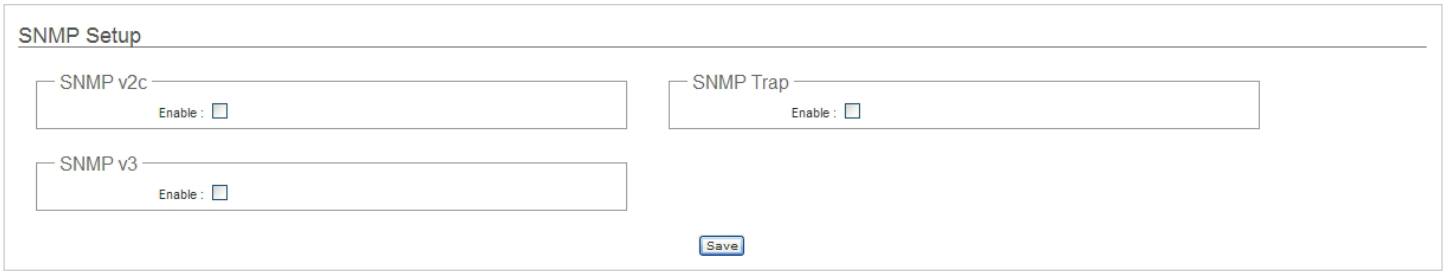


If these devices are not available, you should verify that the correct components and services are loaded in Windows XP. Please refer to ***Appendix D. Using UPnP on Windows XP***

3.4.4 Configure SNMP Setup

SNMP is an application-layer protocol that provides a message format for communication between SNMP managers and agents. By enabling SNMP function, the administrator can obtain the system information remotely.

Please click on **System -> SNMP Setup** and follow the below setting.



- **v2c :** Check “Enable” button to activate SNMP v2c agent or unchecked to deactivate this function.

  - ➔ **ro community :** Enter the community strings that allows read-only access to the system's SNMP information.
  - ➔ **rw community :** Enter the community strings that allows read/write access to the system's SNMP information.

- **v3 :** Check “Enable” button to activate SNMP v3 agent or unchecked to deactivate this function. SNMPv3 supports the highest available levels of security for SNMP communication.

➔ **SNMP ro user :** Enter the community strings that allows read-only access to the system's SNMP information.

➔ **SNMP ro password :** Enter the password that allows read-only access to the system's SNMP information.

➔ **SNMP rw user :** Enter the community strings that allows read/write access to the system's SNMP information.

➔ **SNMP rw password :** Enter the password that allows read/write access to the system's SNMP information.

■ **SNMP Trap :** Events on cold start, interface up & down, and association & disassociation can be reported via this function to an assigned server.

➔ **Community :** Enter the community strings required by the remote host computer that will receive trap messages or notices send by the system.

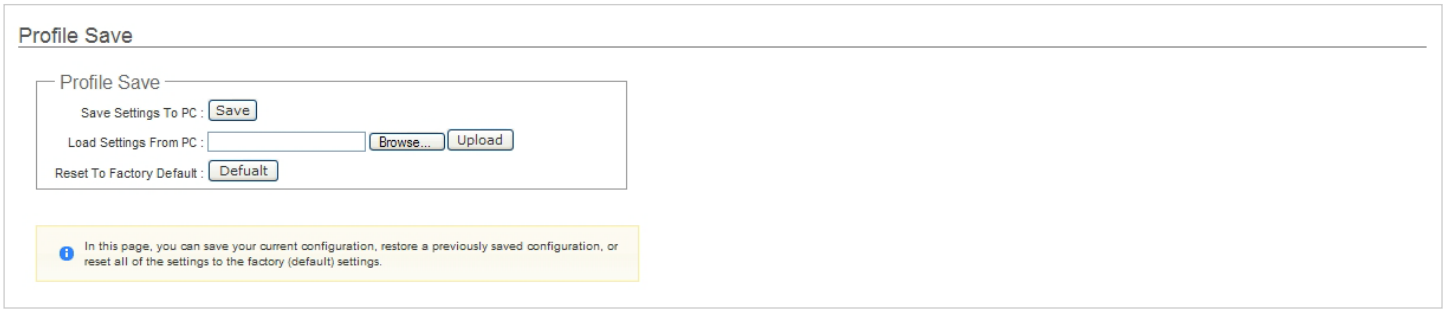
➔ **IP :** Enter the IP address of the remote host computer that will receive the trap messages.

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes

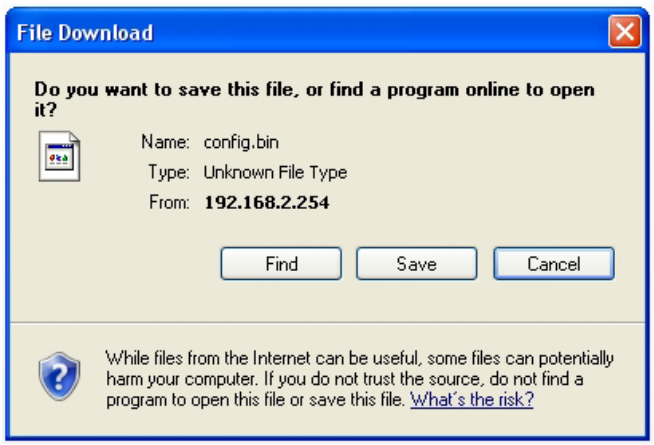
3.4.5 Backup / Restore and Reset to Factory

Current settings on the system can be backed up, or previous backed up settings can be restored as well as resetting the system back to factory default can be performed via this page.

Please click on **Utilities -> Profile Setting** and follow the below setting.


Profile Save
Profile Save
Save Settings To PC : Save
Load Settings From PC : Browse... Upload
Reset To Factory Default : Defualt
In this page, you can save your current configuration, restore a previously saved configuration, or reset all of the settings to the factory (default) settings.

- **Save Settings to PC :** Click ***Save*** button to save the current system settings to a local disk, i.e. the HDD of a local computer or Compact Disc.


File Download
Do you want to save this file, or find a program online to open it?
Name: config.bin
Type: Unknown File Type
From: 192.168.2.254
Find
Save
Cancel
While files from the Internet can be useful, some files can potentially harm your computer. If you do not trust the source, do not find a program to open this file or save this file. What's the risk?

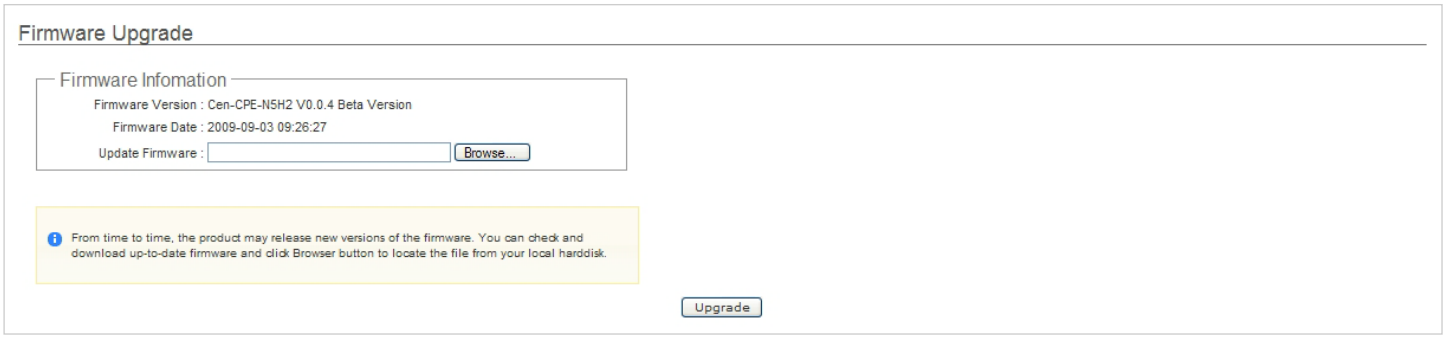
- **Load Settings from PC :** Click ***Browse*** button to search for a previously saved backup file, and then click ***Upload*** button to upload the settings; the system will then be configured to the same settings as specified by the backup file.

- **Reset To Factory Default :** Click ***Default*** button to load the factory default settings of "Air Force One 5", and then **Success Message** page appears. Click ***Reboot*** button to set default configuration.

3.4.6 Firmware Upgrade

Firmware is the main software image, which the system needs to perform all tasks in real time. Firmware upgrades are required for adding new features or to resolve bugs. It takes about **2 minutes** to upload/ upgrade flash and be patient please.

To upgrade the system firmware, click ***Browse*** to search for the new firmware file, and then click ***Upgrade*** button to execute the upgrade process.

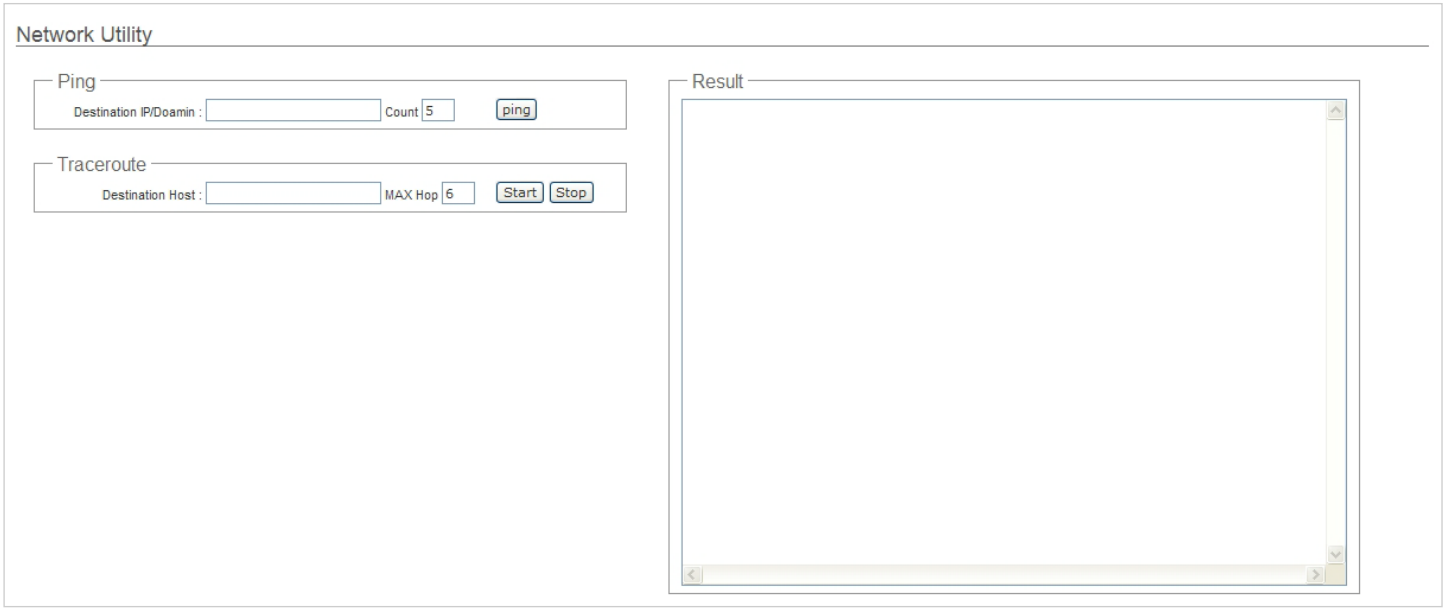

Firmware Upgrade
Firmware Infomation
Firmware Version : Cen-CPE-N5H2 V0.0.4 Beta Version
Firmware Date : 2009-09-03 09:26:27
Update Firmware :
Browse...
From time to time, the product may release new versions of the firmware. You can check and download up-to-date firmware and click Browser button to locate the file from your local harddisk.
Upgrade

1. *To prevent data loss during firmware upgrade, please back up the current settings before proceeding to firmware upgrade.*
2. *During the upgrading. Do not interrupt the system, i.e. power on/off, during the upgrading process or the restarting process as this may damage system.*

3.4.7 Network Utility

The administrator can diagnose the network connectivity via this function.

Please click on **Utilities -> Network Utility** and follow the below setting.



- **Ping :** This utility will ping other devices on the network directly form the “Air Force One 5” device.

  Ping utility should be used for the preliminary link quality and packet latency estimation between two network devices using the ICMP packets. Packet loss statistics and latency time evaluation is provided after the test is completed.

  ➔ **Destination IP/Domain :** Enter the desired domain name or IP address of the target device for diagnosis purpose, i.e. www.google.com, and click ***ping*** button to proceed. The ping result will be shown in the **Result** field.

  ➔ **Count :** Estimation is done after the number of ICMP packets; default is 5, maximum is 50.

- **Traceroute :** Allows tracing the hops from the “Air Force One 5” device to a selected outgoing IP address. It should be used for the finding the route taken by ICMP packets across the network to the destination host.

  ➔ **Destination Host :** Specifies the Destination Host for the finding the route taken by ICMP packets across the network.

  ➔ **MAX Hop :** Specifies the maximum number of hops(max time-to-live value) traceroute will probe.

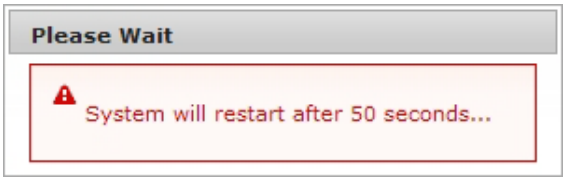
The test is started using the **Start** button, click Stop button to stopped test

3.4.8 Reboot

This function allows the administrator to safely restart the "Air Force One 5". Click ***Reboot*** to restart the system immediately, and the whole process will take about three minutes to complete.

Reboot
You must be reboot the system after changing settings. Rebooting the system will not delete any of your configuration settings. Click reboot button to reboot the system.
Reboot

The Pop-up Restart window as displayed below appears during the rebooting period. If turning off the power is necessary, please allow the restart process to be completed before turning off the system.



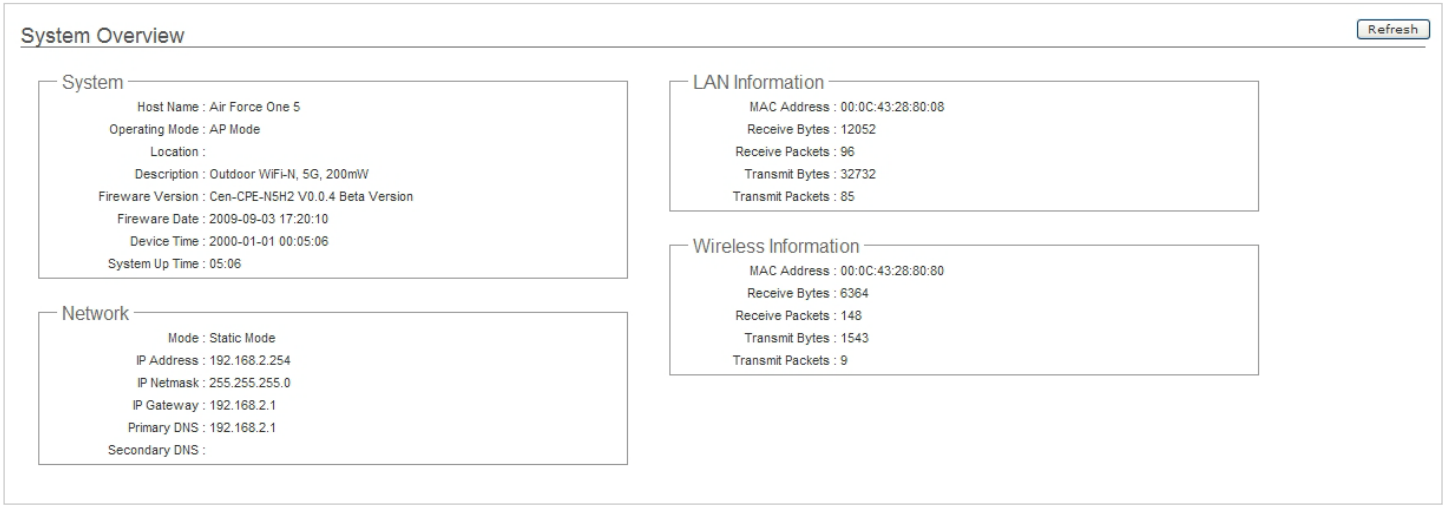
The **System Overview** page appears upon the completion of reboot.

3.5 Observer Status

Information of current system settings can be over viewed via this page; statuses of **Overview**, **Clients**, **WDS Status**, **Extra Information** and **Event Log** are displayed in this interface.

3.5.1 System Overview

Detailed information on **System**, **Network**, **LAN Information** and **Wireless Information** can be reviewed via this page.



- **System :** Display the information of the system.
  - ➔ **System Name :** The name of the system.
  - ➔ **Operating Mode :** The mode currently in service.
  - ➔ **Location :** The reminding note on the geographical location of the system.
  - ➔ **Description :** The reminding note of the system.
  - ➔ **Firmware Version :** The current firmware version installed.
  - ➔ **Firmware Date :** The build time of the firmware installed.
  - ➔ **Device Time :** The current time of the system.
  - ➔ **System Up Time :** The time period that the system has been in service since last boot-up.

- **Network Information :** Display the information of the Network.

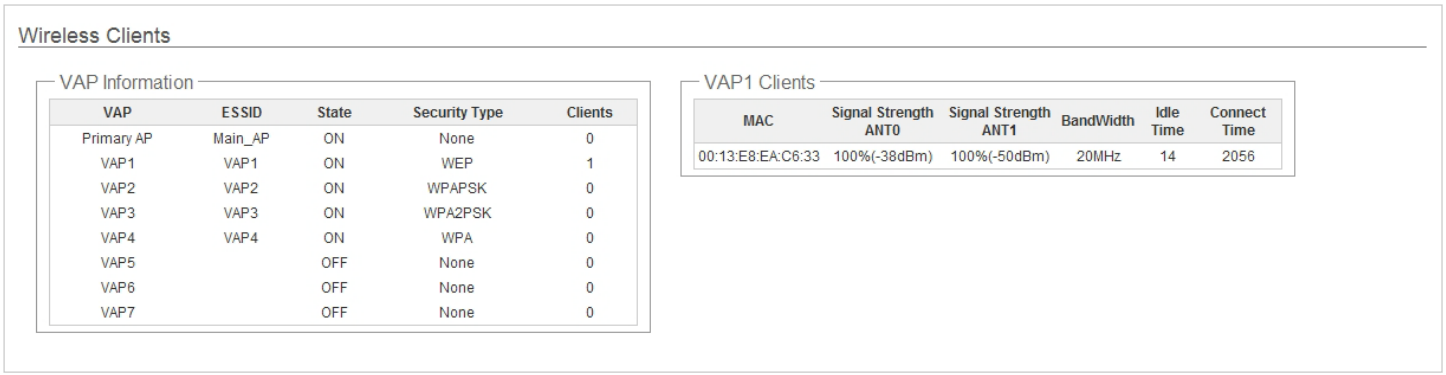
- ➔ **Mode :** The current mode of the LAN port.
- ➔ **IP Address :** The IP address of the LAN port.
- ➔ **IP Netmask :** The IP netmask of the LAN port.
- ➔ **IP Gateway :** The gateway IP address of the LAN port.
- ➔ **Primary DNS :** The current primary DNS server of the system.
- ➔ **Secondary DNS :** The current secondary DNS server of the system.

- **LAN Information :** Display the detailed receive and transmit statistics of LAN interface.
  - ➔ **MAC Address :** The MAC address of the LAN port.
  - ➔ **Receive bytes :**The current receive bytes of the LAN port.
  - ➔ **Receive packets :** The current receive packets of the LAN port.
  - ➔ **Transmit bytes :** The current transmit bytes of the LAN port.
  - ➔ **Transmit packets :** The current transmit packets of the LAN port.

- **Wireless Information :** Display the detailed receive and transmit statistics of Wireless interface.
  - ➔ **MAC Address :** The MAC address of the Wireless port.
  - ➔ **Receive bytes :**The current receive bytes of the Wireless port.
  - ➔ **Receive packets :** The current receive packets of the Wireless port.
  - ➔ **Transmit bytes :** The current transmit bytes of the Wireless port.
  - ➔ **Transmit packets :** The current transmit packets of the Wireless port.

3.5.2 Associated Clients Status

The administrator can obtain detailed Information such as VAP, ESSID, MAC Address, Status, and Security Type of all associated clients via this page.


Wireless Clients

VAP Information

VAP	ESSID	State	Security Type	Clients
Primary AP	Main_AP	ON	None	0
VAP1	VAP1	ON	WEP	1
VAP2	VAP2	ON	WPAPSK	0
VAP3	VAP3	ON	WPA2PSK	0
VAP4	VAP4	ON	WPA	0
VAP5		OFF	None	0
VAP6		OFF	None	0
VAP7		OFF	None	0

VAP1 Clients

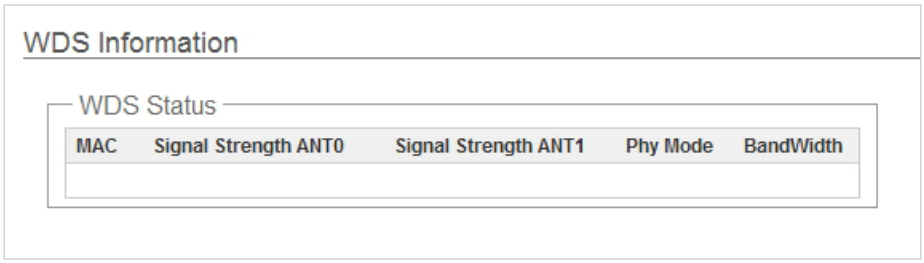
MAC	Signal Strength ANT0	Signal Strength ANT1	BandWidth	Idle Time	Connect Time
00:13:E8:EA:C6:33	100%(-38dBm)	100%(-50dBm)	20MHz	14	2056

- **VAP Information :** Display all Virtual AP's information
  - ➔ **VAP :** Indicate the system's Virtual AP
  - ➔ **ESSID :** Indicate the ESSID of the respective Virtual AP
  - ➔ **Status :** Indicate the Status of the respective Virtual AP
  - ➔ **Security Type :** Indicate the security type of the respective Virtual AP used.
  - ➔ **Clients :** Indicate the number of connection on the respective Virtual AP.

- **VAP Clients :** Display all associated clients on each Virtual AP
  - ➔ **MAC :** indicate the MAC address of the respective client's association.
  - ➔ **Signal Strength ANT0/ANT1 :** Indicate the signal strength of the respective client's association.
  - ➔ **Bandwidth :** Indicate the channel bandwidth of the respective client's association.
  - ➔ **Idle Time :** Time period the associated client is inactive (units in seconds).
  - ➔ **Connect Time :** Time period the associated client is connection (units in seconds).

3.5.3 Show WDS Link Status

The administrator can obtain detailed Information such as MAC Address, Signal Strength of all WDS link via this page.

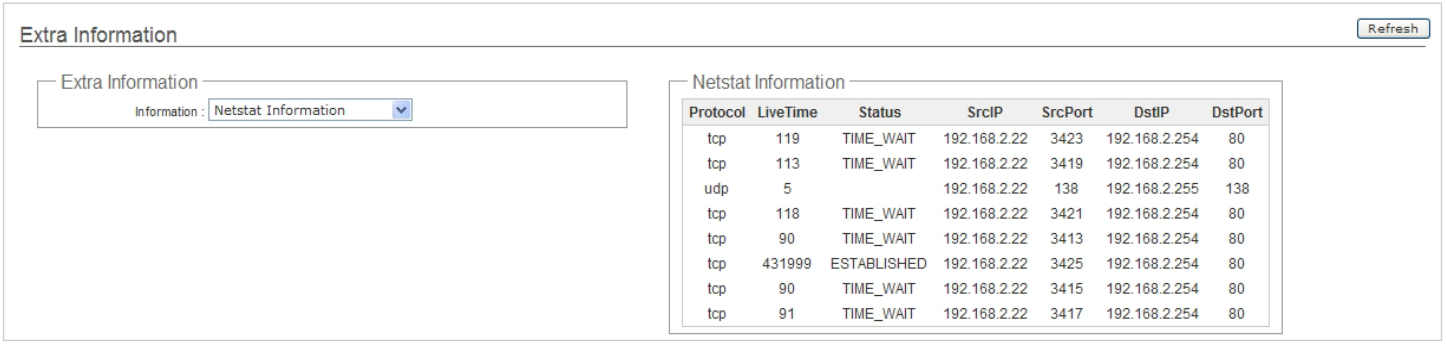


- **MAC :** Display MAC address of WDS peer.
- **Signal Strength ANT0/ANT1 :** Indicate the signal strength of the respective WDS linked.
- **Phy Mode :** Indicate the phy mode of the respective WDS linked.
- **BandWidth :** Indicate the channel bandwidth of the respective WDS linked.

*If Signal Strength ANT0/ANT1 display "**no signal**", you need check WDS configuration. Verify **MAC Address**, **Channel** and **Security type** is the same; also adjust system's antenna angle.*

3.5.4 Extra Information

The administrator can get current device usage statistics and status of the system components from drop-down list.



Protocol	LiveTime	Status	SrcIP	SrcPort	DstIP	DstPort
tcp	119	TIME_WAIT	192.168.2.22	3423	192.168.2.254	80
tcp	113	TIME_WAIT	192.168.2.22	3419	192.168.2.254	80
udp	5		192.168.2.22	138	192.168.2.255	138
tcp	118	TIME_WAIT	192.168.2.22	3421	192.168.2.254	80
tcp	90	TIME_WAIT	192.168.2.22	3413	192.168.2.254	80
tcp	431999	ESTABLISHED	192.168.2.22	3425	192.168.2.254	80
tcp	90	TIME_WAIT	192.168.2.22	3415	192.168.2.254	80
tcp	91	TIME_WAIT	192.168.2.22	3417	192.168.2.254	80

- **Show Netstat Information :** Select "**NetStatus Information**" on the drop-down list, the connection track list should show-up, the list can be updated using the Refresh button.

  NetStatus will show all connection track on the system, the information include *Protocol*, *Live Time*, *Status* , *Source/Destination IP address* and *Port*.

- **Show Route Information :** Select "**Route Information**" on the drop-down list, the route table should shown-up, the list can be updated using the Refresh button.

  "Air Force One 5" examines the destination IP address of each data packet traveling through the system and chooses the appropriate interface to forward the packet to. The system choice depends on static routing rules – entries, which are registered in system routing table. Static routes to specific hosts, networks or default gateway are set up automatically according to the IP configuration of all the system's interfaces.

Route Information

Destination	Gateway	Genmask	Flags	Metric	Ref	Use	Iface
192.168.2.0	0.0.0.0	255.255.255.0	U	0	0	0	bre0
127.0.0.0	0.0.0.0	255.255.255.0	U	0	0	0	lo
0.0.0.0	192.168.2.1	0.0.0.0	UG	0	0	0	bre0

- **Show ARP Information :** Select "**ARP Table Information**" on the drop-down list, the ARP table should show-up, the list can be updated using the Refresh button.

ARP is used to associate each IP address to the unique hardware address (MAC) of the devices. It is important to have unique IP addresses for each MAC or else there will be ambiguous routes in the network.

ARP Table Information

IP Address	HW Type	Flags	HW Address	Mask	Device
192.168.2.22	0x1	0x2	00:1A:92:9F:A4:9B	*	bre0

- **Show Bridge Table Information :** Select "**Bridge Table Information**" on the drop-down list, the bridge table should show-up, the list can be updated using the Refresh button.

  Bridge table will show Bridge ID and STP's Status on the each Ethernet bridge and its attached interfaces, the Bridge Port should be attached to some interfaces.

Bridge Table Information

Bridge Port	Bridge ID	STP Enabled	Interface
bre0	8000.000c432880b0	no	eth2
			ra0

- **Show MAC Information :** Select "**Bridge MACs Information**" on the drop-down list, all the list of MAC address should show up on the bridge table, the list can be updated using the Refresh button.

  Bridge MACs shows to which Bridge Port the particular station is associated to - in other words from which Interface (Ethernet or wireless) the network device (defined by MAC address) is reachable to the system while forwarding the packets to that port only (thus saving a lot of redundant copies and transmits).

  Ageing timer shows ageing time for each address entry (in seconds) - after particular time out, not having seen a packet coming from a certain address, the bridge will delete that address from the Bridge Table.

Bridge MACs Information

Port No	MAC Address	Local	Ageing Timer
1	00:0c:43:28:80:08	yes	0.00
2	00:0c:43:28:80:80	yes	0.00
1	00:1a:92:9f:a4:9b	no	0.03

- **Show STP Information :** Select “**Bridge STP Information**” on the drop-down list, all the list of STP information should show up on the STP table.

Bridge STP Information

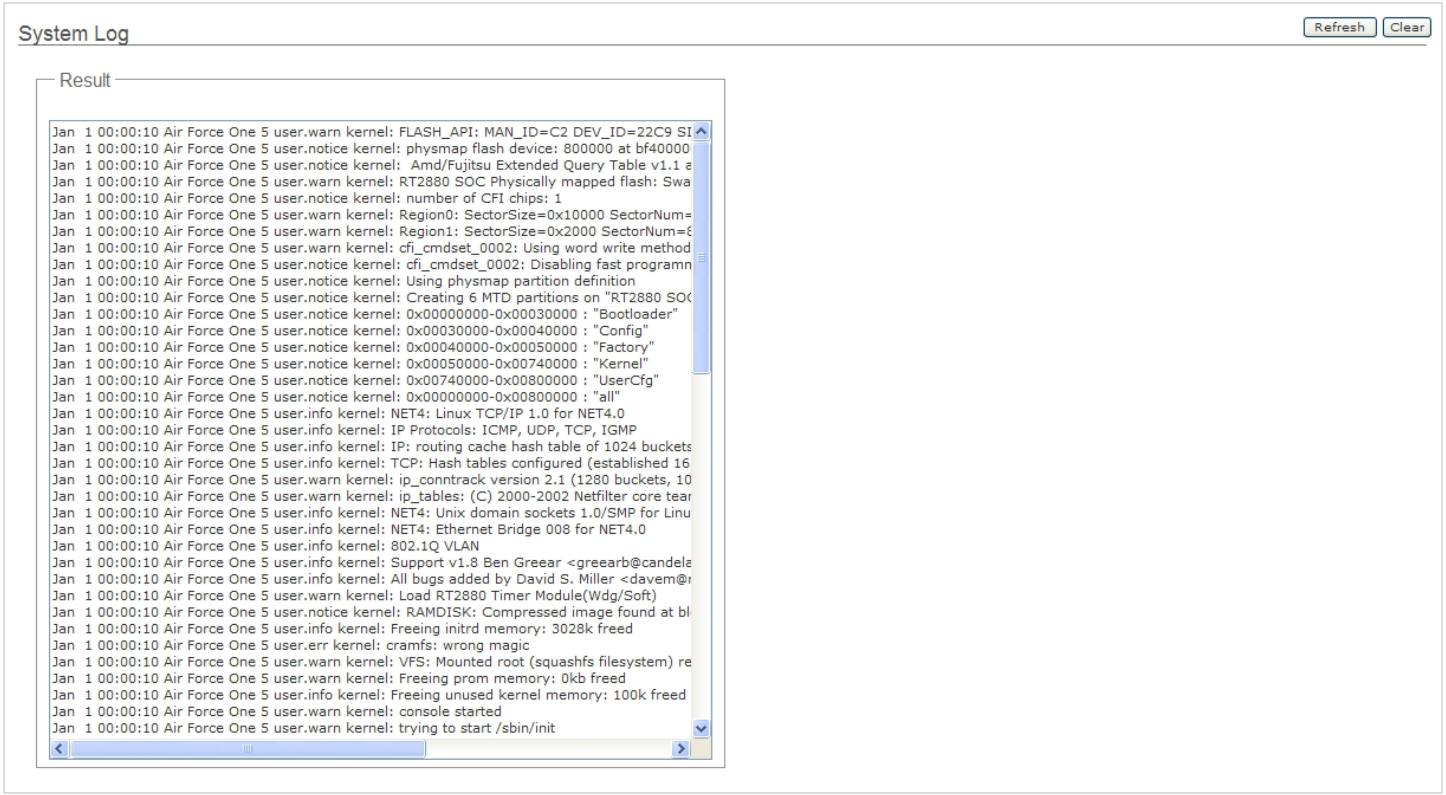
bre0			
bridge id	8000.000c43288008		
designated root	8000.000c43288008		
root port	0	path cost	0
max age	20.00	bridge max age	20.00
hello time	2.00	bridge hello time	2.00
forward delay	15.00	bridge forward delay	15.00
ageing time	300.00		
hello timer	0.84	tcn timer	0.00
topology change timer	0.00	gc timer	2.83
flags			

eth2 (1)			
port id	8001	state	forwarding
designated root	8000.000c43288008	path cost	100
designated bridge	8000.000c43288008	message age timer	0.00
designated port	8001	forward delay timer	0.00
designated cost	0	hold timer	0.85
flags			

ra0 (2)			
port id	8002	state	forwarding
designated root	8000.000c43288008	path cost	100
designated bridge	8000.000c43288008	message age timer	0.00
designated port	8002	forward delay timer	0.00
designated cost	0	hold timer	0.85
flags			

3.5.5 Event Log

The reported system events can be reviewed here.


System Log
Refresh
Clear
Result
Jan 1 00:00:10 Air Force One 5 user.warn kernel: FLASH_API: MAN_ID=C2 DEV_ID=22C9 SI
Jan 1 00:00:10 Air Force One 5 user.notice kernel: physmap flash device: 800000 at bf40000
Jan 1 00:00:10 Air Force One 5 user.notice kernel: Amd/Fujitsu Extended Query Table v1.1 a
Jan 1 00:00:10 Air Force One 5 user.warn kernel: RT2880 SOC Physically mapped flash: Swa
Jan 1 00:00:10 Air Force One 5 user.notice kernel: number of CFI chips: 1
Jan 1 00:00:10 Air Force One 5 user.warn kernel: Region0: SectorSize=0x10000 SectorNum=
Jan 1 00:00:10 Air Force One 5 user.warn kernel: Region1: SectorSize=0x2000 SectorNum=8
Jan 1 00:00:10 Air Force One 5 user.warn kernel: cfi_cmdset_0002: Using word write method
Jan 1 00:00:10 Air Force One 5 user.notice kernel: cfi_cmdset_0002: Disabling fast programn
Jan 1 00:00:10 Air Force One 5 user.notice kernel: Using physmap partition definition
Jan 1 00:00:10 Air Force One 5 user.notice kernel: Creating 6 MTD partitions on "RT2880 SO
Jan 1 00:00:10 Air Force One 5 user.notice kernel: 0x00000000-0x00030000 : "Bootloader"
Jan 1 00:00:10 Air Force One 5 user.notice kernel: 0x00030000-0x00040000 : "Config"
Jan 1 00:00:10 Air Force One 5 user.notice kernel: 0x00040000-0x00050000 : "Factory"
Jan 1 00:00:10 Air Force One 5 user.notice kernel: 0x00050000-0x00740000 : "Kernel"
Jan 1 00:00:10 Air Force One 5 user.notice kernel: 0x00740000-0x00800000 : "UserCfg"
Jan 1 00:00:10 Air Force One 5 user.notice kernel: 0x00000000-0x00800000 : "all"
Jan 1 00:00:10 Air Force One 5 user.info kernel: NET4: Linux TCP/IP 1.0 for NET4.0
Jan 1 00:00:10 Air Force One 5 user.info kernel: IP Protocols: ICMP, UDP, TCP, IGMP
Jan 1 00:00:10 Air Force One 5 user.info kernel: IP: routing cache hash table of 1024 buckets
Jan 1 00:00:10 Air Force One 5 user.info kernel: TCP: Hash tables configured (established 16
Jan 1 00:00:10 Air Force One 5 user.warn kernel: ip_conntrack version 2.1 (1280 buckets, 10
Jan 1 00:00:10 Air Force One 5 user.warn kernel: ip_tables: (C) 2000-2002 Netfilter core tear
Jan 1 00:00:10 Air Force One 5 user.info kernel: NET4: Unix domain sockets 1.0/SMP for Linu
Jan 1 00:00:10 Air Force One 5 user.info kernel: NET4: Ethernet Bridge 008 for NET4.0
Jan 1 00:00:10 Air Force One 5 user.info kernel: 802.1Q VLAN
Jan 1 00:00:10 Air Force One 5 user.info kernel: Support v1.8 Ben Greear <greearb@candela
Jan 1 00:00:10 Air Force One 5 user.info kernel: All bugs added by David S. Miller <davem@r
Jan 1 00:00:10 Air Force One 5 user.warn kernel: Load RT2880 Timer Module(Wdg/Soft)
Jan 1 00:00:10 Air Force One 5 user.notice kernel: RAMDISK: Compressed image found at bl
Jan 1 00:00:10 Air Force One 5 user.info kernel: Freeing initrd memory: 3028k freed
Jan 1 00:00:10 Air Force One 5 user.err kernel: cramfs: wrong magic
Jan 1 00:00:10 Air Force One 5 user.warn kernel: VFS: Mounted root (squashfs filesystem) re
Jan 1 00:00:10 Air Force One 5 user.warn kernel: Freeing prom memory: 0kb freed
Jan 1 00:00:10 Air Force One 5 user.info kernel: Freeing unused kernel memory: 100k freed
Jan 1 00:00:10 Air Force One 5 user.warn kernel: console started
Jan 1 00:00:10 Air Force One 5 user.warn kernel: trying to start /sbin/init

- **Date/ Time:** The date and time when the event occurred.
- **Hostname:** The name of the host which records the event. It helps the administrator identify the source of the reported events.
- **Process name (with square brackets):** Indicate the process with which the specific event is associated.
- **Description:** Description of the event.

Click ***Refresh*** button to renew the log, or click ***Clear*** button to clear all the record.

Chapter 4. WDS Mode Configuration

When WDS mode is activated, the system can be configured as a repeater or client bridge. This section provides information in configuring the WDS mode with graphical illustrations. "Air Force One 5" provides functions as stated below where they can be configured via a user-friendly web based interface.

Option	System	Wireless	Utilities	Status
Functions	Operating Mode	General Settings	Profiles Settings	System Overview
	LAN	Advanced Settings	Firmware Upgrade	WDS Status
	Management	WDS Setup	Network Utility	Extra Info
	Time Server		Reboot	Event Log
	UPnP			
	SNMP			

Table 4-1: WDS Mode Functions

4.1 External Network Connection

4.1.1 Network Requirement

If you want to expand your wireless network through WDS link. In this mode, the “Air Force One 5” (AFO-5) connected directly to a wired LAN, and it cannot accept wireless clients to access wirelessly.

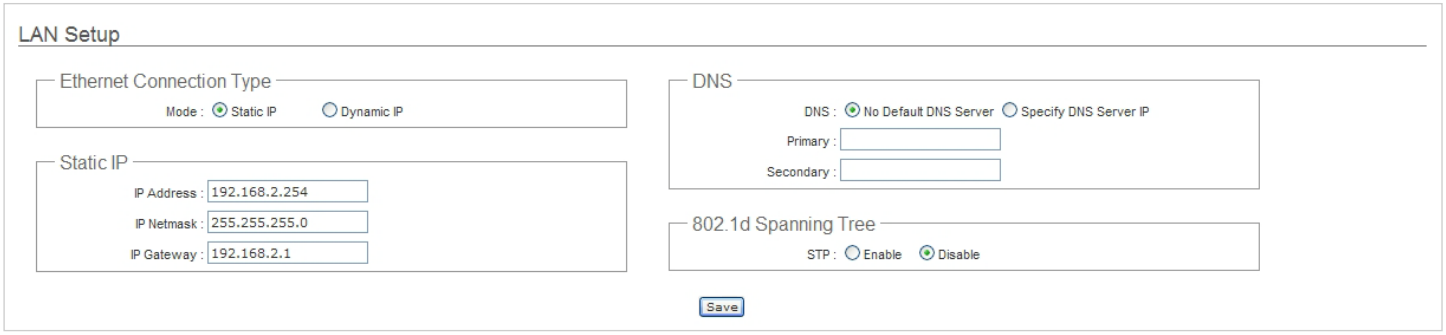
The first step is to get a Default Gateway IP Address from system manager and connect it to the LAN port of “Air Force One 5”. **Figure 4-1** shows Point to Point configuration

Figure 4-1 Point to Point Configuration

4.1.2 Configuration LAN IP

Here are the instructions for how to setup the local IP Address and Netmask.

Please click on **System -> LAN** and follow the below setting.



- **Mode :** Check either “Static IP” or “Dynamic IP” button as desired to set up the system IP of LAN port .
  - ➔ **Static IP :** The administrator can manually setup the LAN IP address when static IP is available/ preferred.
  - ➔ **IP Address :** The IP address of the LAN port; default IP address is 192.168.2.254
  - ➔ **IP Netmask :** The Subnet mask of the LAN port; default Netmask is 255.255.255.0
  - ➔ **IP Gateway :** The default gateway of the LAN port; default Gateway is 192.168.2.1
  - ➔ **Dynamic IP :** This configuration type is applicable when the "Air Force One 5" is connected to a network with the presence of a DHCP server; all related IP information will be provided by the DHCP server automatically.

  - ➔ **Hostname :** The Hostname of the LAN port

- **DNS :** Check either “No Default DNS Server” or “Specify DNS Server IP” button as desired to set up the system DNS.
  - ➔ **Primary :** The IP address of the primary DNS server.
  - ➔ **Secondary :** The IP address of the secondary DNS server.

- **802.1d Spanning Tree**

  The spanning tree network protocol provides a loop free topology for any bridged LAN. The Spanning Tree Protocol, which is also referred to as STP, is defined in the IEEE Standard 802.1d.

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes

4.2 Wireless Network Expansion

The system manager can configure related wireless settings, **General Settings, Advanced Settings, Virtual AP Setting, Security Settings,** and **Access Control Settings**.

4.2.1 General Setup

The administrator can change the data transmission, channel and output power settings for the system. Please click on **Wireless -> General Setup** and follow the below setting.

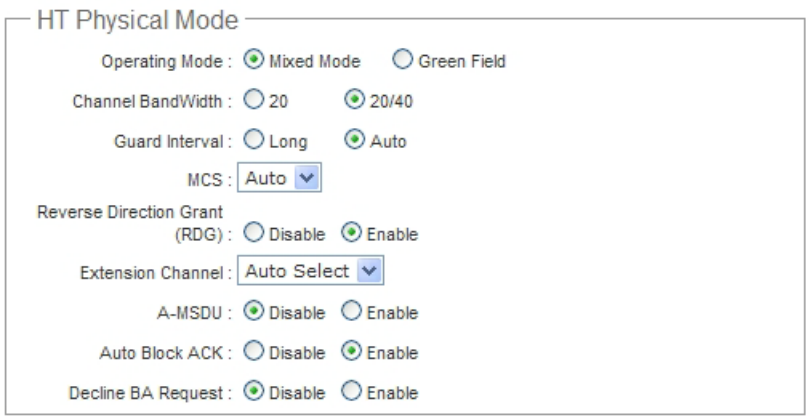
- **MAC address :** The MAC address of the Wireless interface is displayed here.
- **Band Mode :** Select an appropriate wireless band; bands available are **801.11a** or **802.11a/n mixed mode**.
- **Client Isolation :** Select **Enable**, all clients will be isolated from each other, that means all clients can not reach to other clients.
- **Transmit Rate Control :** Select the desired rate from the drop-down list; the options are auto or ranging from 1 to 54Mbps only for **802.11a** mode.
- **Country :** Select the desired country code from the drop-down list; the options are ***US***, ***ETSI***, ***JP*** and ***NONE***.
- **Channel :** The channel range will be changed by selecting different country code. Below depicts the channel range for different ***Country***.

Country	Channel
US	36, 40, 44, 48, 52, 56, 60, 64, 149, 153, 157, 161
ETSI	36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140
Japan	36, 40, 44, 48
NONE	36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 149, 153, 157, 161

- **Tx Power :** You can adjust the output power of the system to get the appropriate coverage for your wireless network. Specify digit number between ***1*** to ***100*** (the unit is %) for your environment. If you are not sure which setting to choose, then keep the default setting, 100%.

When **Band Mode** select in **802.11a/n mixed mode**, the **HT(High Throughput)** settings should be shown-up immediately.

- **HT TxStream/RxStream :** Select 1 or 2 from the drop-down list


HT Physical Mode
Operating Mode : Mixed Mode Green Field
Channel BandWidth : 20 20/40
Guard Interval : Long Auto
MCS : Auto
Reverse Direction Grant (RDG) : Disable Enable
Extension Channel : Auto Select
A-MSDU : Disable Enable
Auto Block ACK : Disable Enable
Decline BA Request : Disable Enable

- **Operating Mode :**

  ➔ **Mixed Mode :** In this mode packets are transmitted with a preamble compatible with the legacy 802.11a/g, the rest of the packet has a new format. In this mode the receiver shall be able to decode both the Mixed Mode

packets and legacy packets.

➔ **Green Field :** In this mode high throughput packets are transmitted without a legacy compatible part.

- **Channel Bandwidth :** The "**20/40**" MHz option is usually best. The other option is available for special circumstances.
- **Guard Interval :** Using "**Auto**" option can increase throughput. However, it can also increase error rate in some installations, due to increased sensitivity to radio-frequency reflections. Select the option that works best for your installation.
- **MCS :** This parameter represents transmission rate. By default (Auto) the fastest possible transmission rate will be selected. You have the option of selecting the speed if necessary.
- **Reverse Direction Grant(RDG) :** Disable or enable reserve direction grant. Default is enabled.
- **Extension Channel :** When 20/40 channel bandwidth has been chosen, you should select extension channel to get higher throughput.
- **A-MSDU : Aggregated** Mac Service Data Unit . Select **Enable** to allow aggregation for multiple MSDUs in one MPDU Default is disabled.
- **Auto Block ACK :** Disable or enable auto block ACK. Default is enabled.
- **Decline BA Request :** Disable or enable decline BA request. Default is disabled.

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes. The items in this page are for AP's RF general settings and will be applied to all VAPs.

4.2.2 Advanced Setup

The administrator can change the RTS threshold and fragmentation threshold settings for the system. Please click on

Wireless Setup
Advanced Setup
Beacon Interval : 100 ms
Data Beacon Rate(DTIM) : 1 ms
Fragment Threshold : 2346
RTS Threshold : 2347
Short Preamble : Enable Disable
Short Slot : Enable Disable
Tx Burst : Enable Disable
Pkt_Aggregate : Enable Disable
IEEE 802.11H : Enable Disable
WMM Capable : Enable Disable
Save

Wireless -> Advanced Setup and follow the below setting.

- **Beacon Interval :** Enter a value between **20** and **1024** msec. The default value is **100** milliseconds. The entered time means how often the beacon signal transmission between the access point and the wireless network.
- **DTIM Interval :** A DTIM is a countdown informing clients of the next window for listening to broadcast and multicast messages. When the wireless router has buffered broadcast or multicast messages for associated clients, it sends the next DTIM with a DTIM Interval value. Wireless clients detect the beacons and awaken to receive the broadcast and multicast messages. The default value is 1. Valid settings are between **1** and **255**.
- **Fragment Threshold :** The value specifies the maximum size of packet allowed before data is fragmented into multiple packets. Please use this value to tune the wireless connection if lots of retransmission happens. Enter a value ranging from **256** to **2346**.
- **RTS Threshold :** Tuning the Request to Send, RTS threshold will help the system control its access to medium and alleviate the hidden node problem. Enter a value ranging from **1** to **2347**.
- **Short Preamble :** The short preamble provides 56-bit Synchronization field to improve WLAN transmission efficiency. Check ***Enable*** button for using Short Preamble, and ***Disable*** for using the Long Preamble, 128-bit Synchronization field, option.
- **Short Slot :** Enable or disable short slot. Default is enabled.
- **Tx Burst :** Click ***Enable*** button to activate Tx Burst, and ***Disable*** to deactivate Tx Burst. Enable the Tx Burst can

increase transmission throughput.

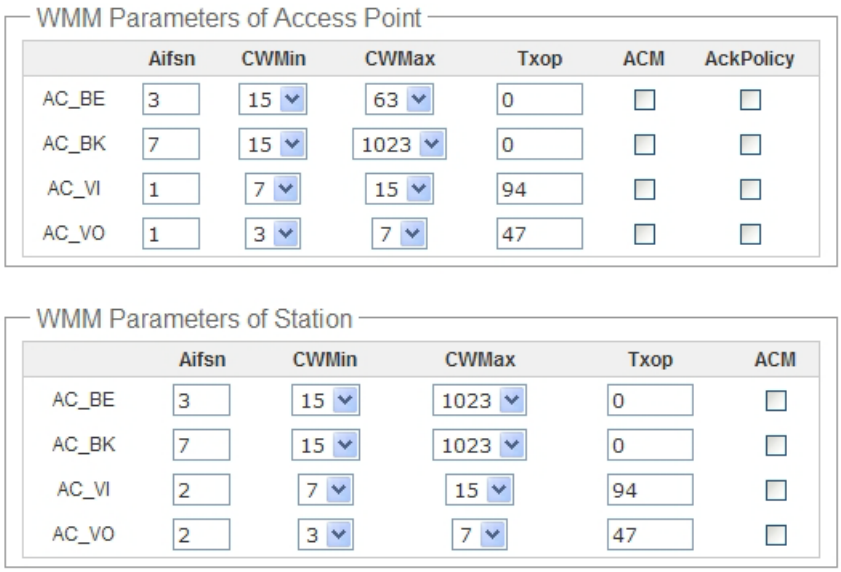
- **Pkt_Aggregate :** Increase efficiency by aggregating multiple packets of application data into a single transmission frame. In this way, 802.11n networks can send multiple data packets with the fixed overhead cost of just a single frame.

- **IEEE802.11H :** Select Enable to enable DFS(Dynamic Frequency Selection). Default is Enable. When a DFS-enabled radio is operating on one of the following channels, the wireless device uses DFS to monitor the operating frequency and switch to another frequency or reduce power as necessary:

DFS Channels	52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 136, 140

The maximum legal transmit power is greater for some 5 GHz channels than for others. When the wireless device randomly selects a 5 GHz channel on which power is restricted, the wireless device automatically reduces transmit power to comply with power limits for that channel in that regulatory domain.

- **WMM Capable :** Select Enable, the configuration field of WMM parameters should be appears.


WMM Parameters of Access Point
Aifsn CWMin CWMax Txop ACM AckPolicy
AC_BE 3 15 63 0
AC_BK 7 15 1023 0
AC_VI 1 7 15 94
AC_VO 1 3 7 47
WMM Parameters of Station
Aifsn CWMin CWMax Txop ACM
AC_BE 3 15 1023 0
AC_BK 7 15 1023 0
AC_VI 2 7 15 94
AC_VO 2 3 7 47

When you enable WMM Capable, the "Tx Burst" will be Disabled automatically by system.

➔ **WMM Parameters of Access Point :** *This affects traffic flowing from the access point to the client station*

Queue	Data Transmitted AP to Clients	Priority	Description
AC_BK	Background.	Low	High throughput. Bulk data that requires maximum throughput and is not time-sensitive is sent to this queue (FTP data, for example).
AC_BE	Best Effort	Medium	Medium throughput and delay. Most traditional IP data is sent to this queue
AC_VI	Video	High	Minimum delay. Time-sensitive video data is automatically sent to this queue
AC_VO	Voice	High	Time-sensitive data like VoIP and streaming media are automatically sent to this queue

Configuring QoS options consists of setting parameters on existing queues for different types of wireless traffic. You can configure different minimum and maximum wait times for the transmission of packets in each queue based on the requirements of the media being sent. Queues automatically provide minimum transmission delay for Voice, Video, multimedia, and mission critical applications, and rely on best-effort parameters for traditional IP data.

As an Example, time-sensitive Voice & Video, and multimedia are given effectively higher priority for transmission (lower wait times for channel access), while other applications and traditional IP data which are less time-sensitive but often more data-intensive are expected to tolerate longer wait times.

- ✓ **Aifsn** : The Arbitration Inter-Frame Spacing Number specifies a wait time (in milliseconds) for data frames
- ✓ **CWmin** : Minimum Contention Window. This parameter is input to the algorithm that determines the initial random backoff wait time ("window") for retry of a transmission. The value specified here in the Minimum Contention Window is the upper limit (in milliseconds) of a range from which the initial random backoff wait time is determined.
- ✓ **CWmax** : Maximum Contention Window. The value specified here in the Maximum Contention Window is the upper limit (in milliseconds) for the doubling of the random backoff value. This doubling continues until either the data frame is sent or the Maximum Contention Window size is reached. Once the Maximum Contention Window size is reached, retries will continue until a maximum number of retries allowed is reached. Valid values for the "cwmax" are 1, 3, 7, 15, 31, 63, 127, 255, 511, or 1024. The value for "cwmax" must be higher than the value for "cwmin".

- ✓ **Txop** : Transmission Opportunity is an interval of time when a WME AP has the right to initiate transmissions onto the wireless medium (WM). This value specifies (in milliseconds) the Transmission Opportunity (TXOP) for AP; that is, the interval of time when the WMM AP has the right to initiate transmissions on the wireless network.
- ✓ **ACM :** Admission Control Mandatory, ACM only takes effect on AC_VI and AC_VO. When you do not click Checkbox, it means that the ACM is controlled by the connecting AP. If you click Checkbox, it means that the Client is in charge.
- ✓ **AckPolicy :** Acknowledgment Policy, WMM defines two ACK policies: **Normal ACK** and **No ACK**. Click "**Checkbox**" indicates "**No ACK**"

  When the no acknowledgement (No ACK) policy is used, the recipient does not acknowledge received packets during wireless packet exchange. This policy is suitable in the environment where communication quality is fine and interference is weak. While the No ACK policy helps improve transmission efficiency, it can cause increased packet loss when communication quality deteriorates. This is because when this policy is used, a sender does not retransmit packets that have not been received by the recipient.

  When the Normal ACK policy is used, the recipient acknowledges each received unicast packet.

➔ **WMM Parameters of Station :** *This affects traffic flowing from the client station to the access point.*

Queue	Data Transmitted Clients to AP	Priority	Description
AC_BK	Background.	Low	High throughput. Bulk data that requires maximum throughput and is not time-sensitive is sent to this queue (FTP data, for example).
AC_BE	Best Effort	Medium	Medium throughput and delay. Most traditional IP data is sent to this queue
AC_VI	Video	High	Minimum delay. Time-sensitive video data is automatically sent to this queue
AC_VO	Voice	High	Time-sensitive data like VoIP and streaming media are automatically sent to this queue

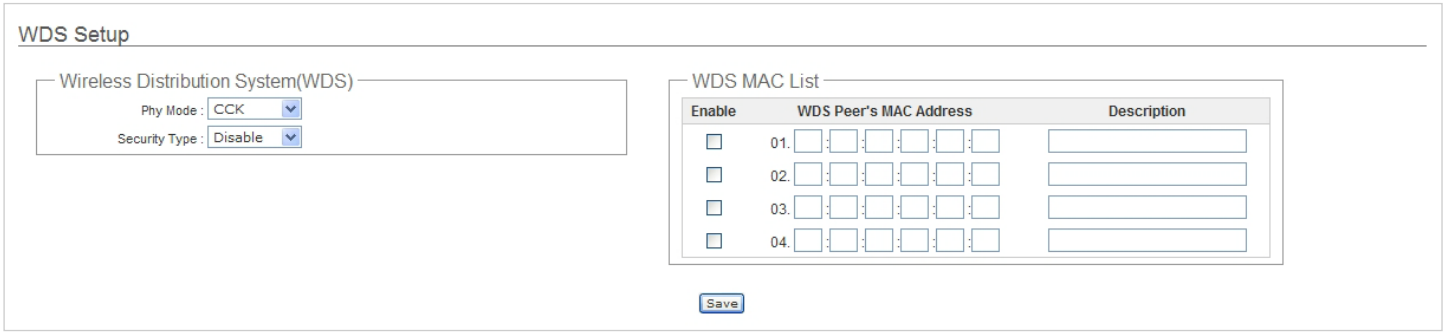
- ✓ **Aifsn** : The Arbitration Inter-Frame Spacing Number specifies a wait time (in milliseconds) for data frames
- ✓ **CWmin** : Minimum Contention Window. This parameter is input to the algorithm that determines the initial random backoff wait time ("window") for retry of a transmission. The value specified here in the Minimum Contention Window is the upper limit (in milliseconds) of a range from which the initial random backoff wait time is determined.

- ✓ **CWmax** : Maximum Contention Window. The value specified here in the Maximum Contention Window is the upper limit (in milliseconds) for the doubling of the random backoff value. This doubling continues until either the data frame is sent or the Maximum Contention Window size is reached. Once the Maximum Contention Window size is reached, retries will continue until a maximum number of retries allowed is reached. Valid values for the "cwmax" are 1, 3, 7, 15, 31, 63, 127, 255, 511, or 1024. The value for "cwmax" must be higher than the value for "cwmin".
- ✓ **Txop** : Transmission Opportunity is an interval of time when a WME AP has the right to initiate transmissions onto the wireless medium (WM). This value specifies (in milliseconds) the Transmission Opportunity (Txop) for AP; that is, the interval of time when the WMM AP has the right to initiate transmissions on the wireless network.
- ✓ **ACM :** Admission Control Mandatory, ACM only takes effect on AC_VI and AC_VO. When you do not click Checkbox, it means that the ACM is controlled by the connecting AP. If you click Checkbox, it means that the Client is in charge.

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes. The items in this page are for AP's RF advanced settings and will be applied to all WDS link.

4.2.3 WDS Setup

The administrator can create WDS Links via this page. Please click on **Wireless -> WDS Setup** and follow the below setting.



- **Phy Mode :** Select Phy mode for Multicast frames. The Phy mode can be selected in "**CCK**", "**OFDM**", "**HTMIX**" and "**GREENFIELD**" from drop-down list. The "**HTMIX**" and "**GREENFIELD**" option is only for **802.11a/n mixed mode**

- **Security Type :** Configure an appropriate security type for the WDS link, the Security Type can be select in "**Disable**", "**WEP**", "**AES**" or "**TKIP**" from drop-down list; the type needs to be the same as that configured on WDS peer.

  ➔ **WEP Key :** Enter **5 / 13 ASCII** or **10 / 26 HEX** format WEP key value.

  ➔ **TKIP Key :** Enter **8** to **63 ASCII** or **64 HEX** format TKIP key value.

  ➔ **AES Key :** Enter **8** to **63 ASCII** or **64 HEX** format AES key value.

- **WDS MAC List**

  Enable : Click ***Enable*** button to create WDS link.

  WDS Peer's MAC Address : Enter the MAC address of WDS peer.

  Description : Description of WDS link.

*The WDS link needs to be set at same **Channel** and **Security Type**.*

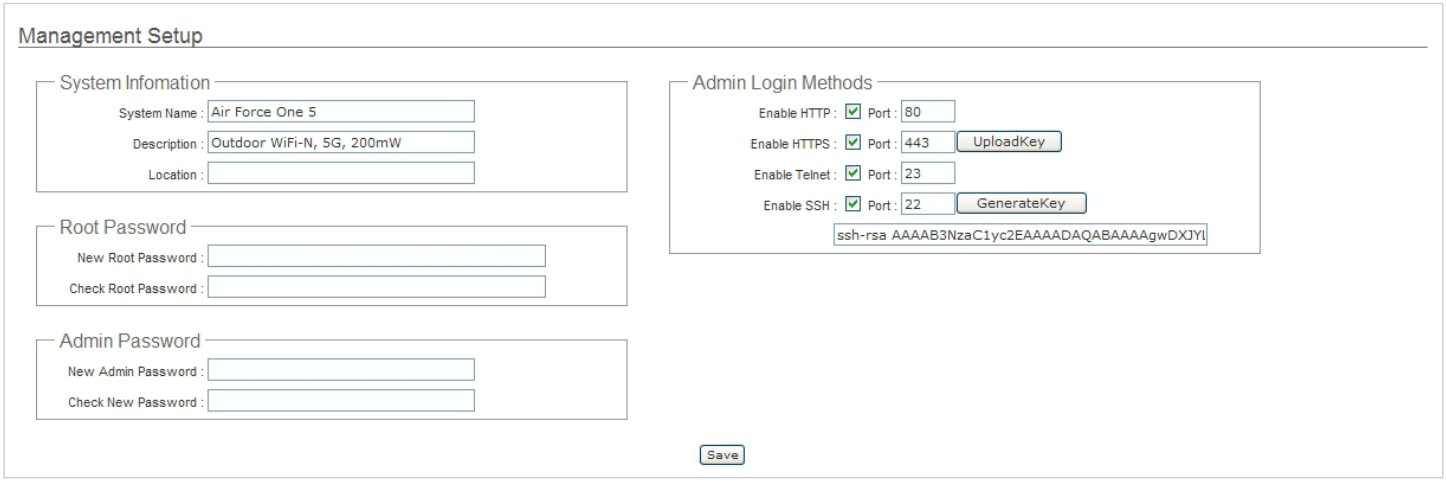
Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes

4.3 System Management

4.3.1 Configuration Management

The administrator can later obtain the geographical location of the system via the information configured here. The administrator also can change system password and configure system login methods.

Please click **System -> Management** and follow the below settings.



- **System Information**
  - ➔ **System Name :** Enter a desired name or use the default provided.
  - ➔ **Description :** Denote further information of the system.
  - ➔ **Location :** Enter related geographical location information of the system; administrator/manager will be able to locate the system easily.

The system supports **two** management accounts, root and admin. The system manager is assigned with full administrative privileges when logging in with the **root** account where the root manager can manage the system in any respect. However, when the system manager logs in via the **admin** account, only basic maintenance can be performed. Therefore, manager with different accounts will have different levels of privileges such as changing passwords; root manager can change passwords for both root account and admin account, however, admin manager can only maintain its own password. For more information on the respective privileges of these two management accounts, please refer to

Appendix C. System Manager Privileges.

- **Root Password :** The **root** manager can change its respective password. Enter the new password, and then verify the new password in the Check New Password filed. Click ***Save*** button to activate the new password.
  - ➔ **New Password :** Please input the new password of administrator.
  - ➔ **Check New Password :** Please input again the new password of administrator.
- **Admin Password :** The **admin** manager can change its respective password. Enter the new password, and then verify the new password in the Check New Password filed. Click ***Save*** button to activate the new password.
  - ➔ **New Password :** Please input the new password of administrator.
  - ➔ **Check New Password :** Please input again the new password of administrator.
- **Admin Login Methods :** The **root** manager can enable or disable system login methods, it can also change services port. Click ***Save*** button to activate the admin login methods.
  - ➔ **Enable HTTP :** Select Enable HTTP to activate HTTP Service
  - ➔ **HTTP Port :** Please input 1 ~ 65535 value to set HTTP Port; default value is 80
  - ➔ **Enable HTTPS :** Select Enable HTTPS to activate HTTPS Service
  - ➔ **HTTPS Port :** Please input 1 ~ 65535 value to set HTTPS Port; default value is 443

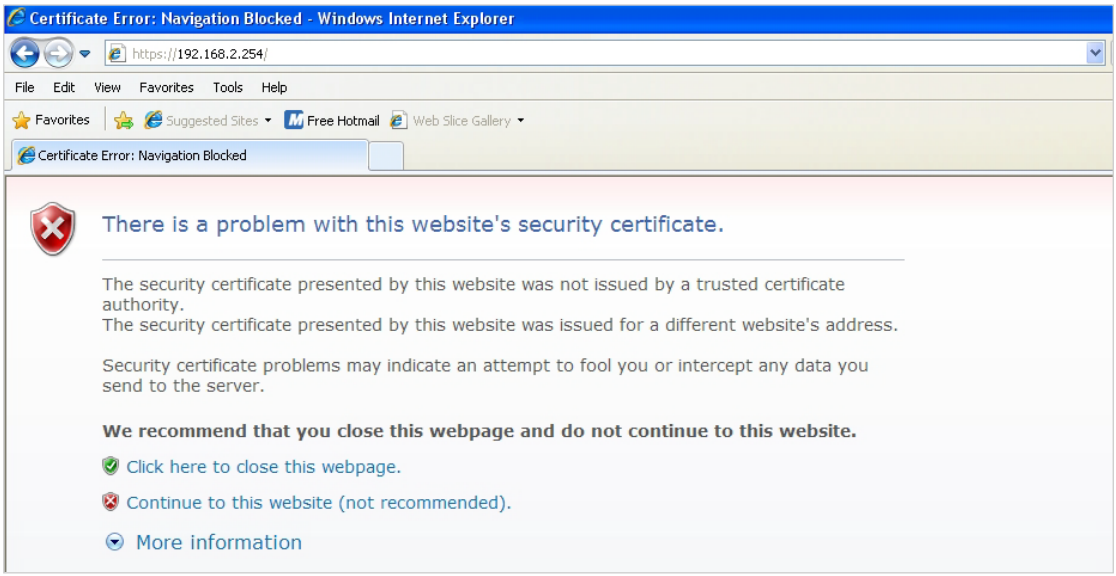
*If you already have an SSL Certificate, please click "**UploadKey**" button to select the file and upload it.*

  - ➔ **Enable Telnet :** Select Enable Telnet to activate Telnet Service
  - ➔ **Telnet Port :** Please input 1 ~ 65535 value to set Telnet Port; default value is 23
  - ➔ **Enable SSH :** Select Enable SSH to activate SSH Service
  - ➔ **SSH Port :** Please input 1 ~ 65535 value to set SSH Port; default value is 22

*Click "**GenerateKey**" button to generate RSA private key. The "Display the host key footprint" gray blank will be show content of RSA key.*

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes

Without a valid certificate, users may encounter the following problem in IE7 when they try to access system's WMI (https://192.168.2.254). There will be a “Certificate Error”, because the browser treats system as an illegal website.

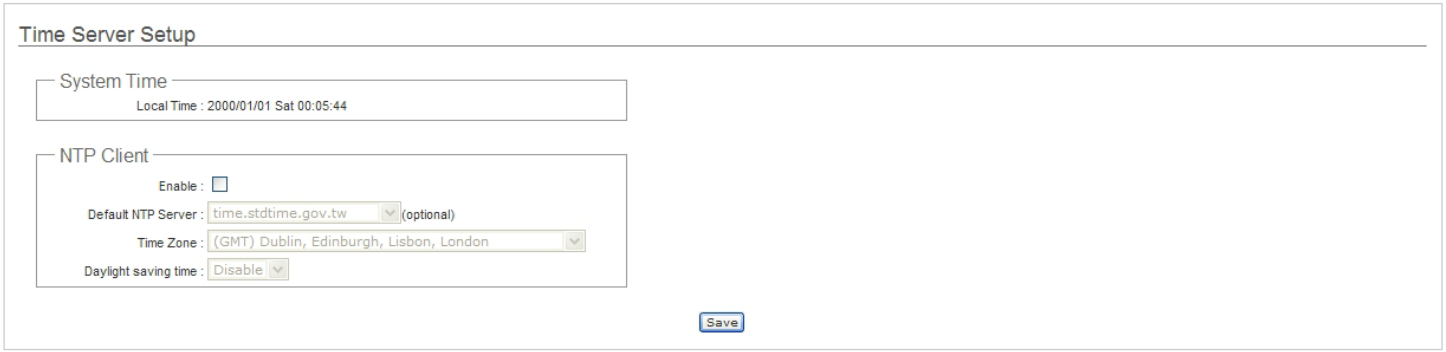

Certificate Error: Navigation Blocked - Windows Internet Explorer
https://192.168.2.254/
File Edit View Favorites Tools Help
Favorites
Suggested Sites
Free Hotmail
Web Slice Gallery
Certificate Error: Navigation Blocked
There is a problem with this website's security certificate.
The security certificate presented by this website was not issued by a trusted certificate authority.
The security certificate presented by this website was issued for a different website's address.
Security certificate problems may indicate an attempt to fool you or intercept any data you send to the server.
We recommend that you close this webpage and do not continue to this website.
Click here to close this webpage.
Continue to this website (not recommended).
More information

Click “***Continue to this website***” to access the system's WMI. The system's Overview page will appear.

4.3.2 Configure System Time

System time can be configured via this page where manual setting and NTP server configuration are both supported.

Please click on **System -> Time Server** and follow the below setting.



- **Local Time :** Display the current time of the system.

- **NTP Client :** Enable Network Time Protocol, NTP, to synchronize the system time with NTP server.

  ➔ **Default NTP Server :** Select the NTP Server from the drop-down list.

  ➔ **Time Zone :** Please set a time zone from where the accurate time can be supplied, **(GMT+08:00) Taipei** for example.

  ➔ **Daylight saving time :** Enable Daylight saving time from where the accurate time needed.

If the current time of the system is incorrect, please verify your network settings, like default Gateway and DNS settings

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes

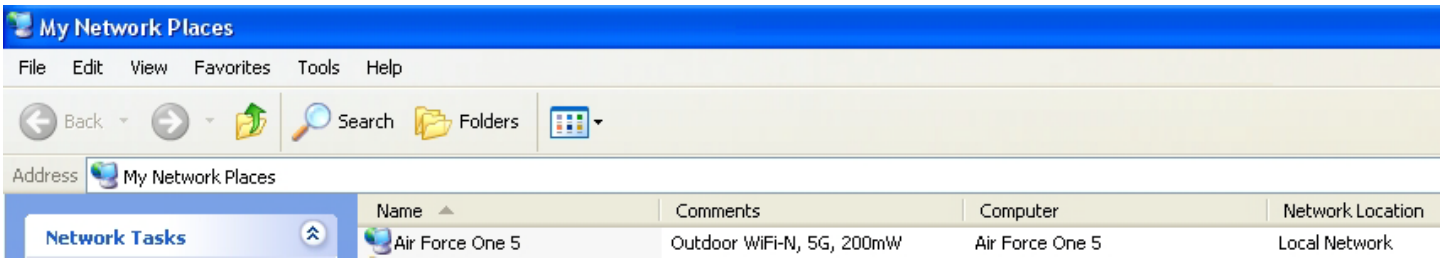
4.3.3 Configure UPnP

UPnP(Universal Plug and Play) is architecture for pervasive peer-to-peer network connectivity of PCs and intelligent devices or appliances, particularly within the home. UPnP builds on Internet standards and technologies, such as TCP/IP, HTTP, and XML, to enable these devices automatically connect with one another and work together to make networking – particularly home networking – possible for more people. Default: **Disable**.

- **UPnP :** Click "**Enable**" to activate UPnP Service or "**Disable**" to deactivate. The default is Disable.

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes

For UPnP to work in Windows XP, the "Air Force One 5" must be available in "***My Network Places***", as shown here: (your specific model may vary)

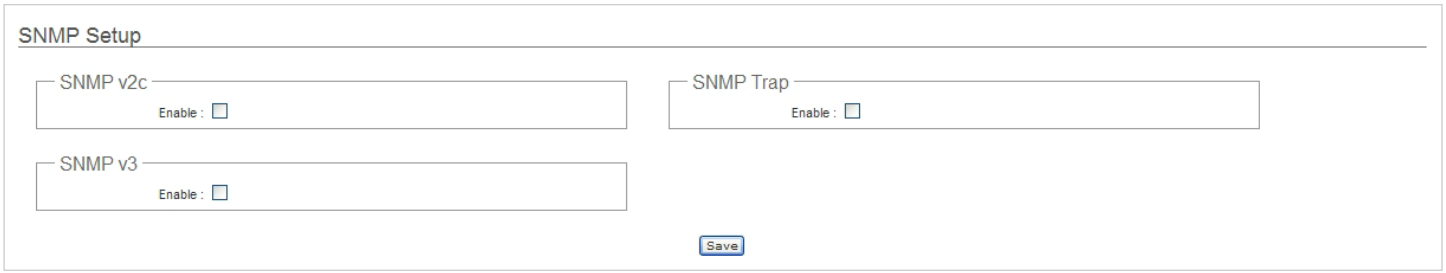

My Network Places
File Edit View Favorites Tools Help
Back Search Folders
Address My Network Places
Network Tasks
Name Comments Computer Network Location
Air Force One 5 Outdoor WiFi-N, 5G, 200mW Air Force One 5 Local Network

If these devices are not available, you should verify that the correct components and services are loaded in Windows XP. Please refer to ***Appendix D. Using UPnP on Windows XP***

4.3.4 Configure SNMP Setup

SNMP is an application-layer protocol that provides a message format for communication between SNMP managers and agents. By enabling SNMP function, the administrator can obtain the system information remotely.

Please click on **System -> SNMP Setup** and follow the below setting.



- **v2c :** Check “Enable” button to activate SNMP v2c agent or unchecked to deactivate this function.

  - ➔ **ro community :** Enter the community strings that allows read-only access to the system's SNMP information.
  - ➔ **rw community :** Enter the community strings that allows read/write access to the system's SNMP information.

- **v3 :** Check “Enable” button to activate SNMP v3 agent or unchecked to deactivate this function. SNMPv3 supports the highest available levels of security for SNMP communication.

- ➔ **SNMP ro user :** Enter the community strings that allows read-only access to the system's SNMP information.
- ➔ **SNMP ro password :** Enter the password that allows read-only access to the system's SNMP information.
- ➔ **SNMP rw user :** Enter the community strings that allows read/write access to the system's SNMP information.
- ➔ **SNMP rw password :** Enter the password that allows read/write access to the system's SNMP information.

■ **SNMP Trap :** Events on cold start, interface up & down, and association & disassociation can be reported via this function to an assigned server.

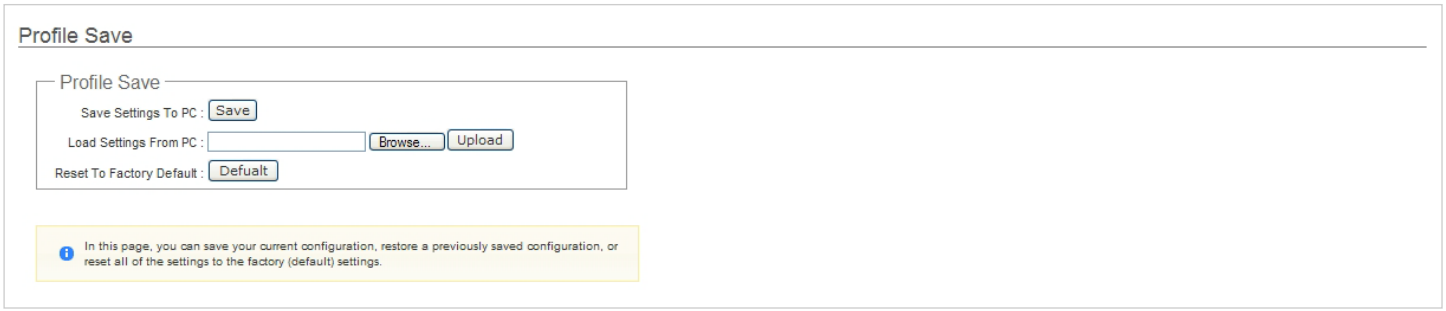
- ➔ **Community :** Enter the community strings required by the remote host computer that will receive trap messages or notices send by the system.
- ➔ **IP :** Enter the IP address of the remote host computer that will receive the trap messages.

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes

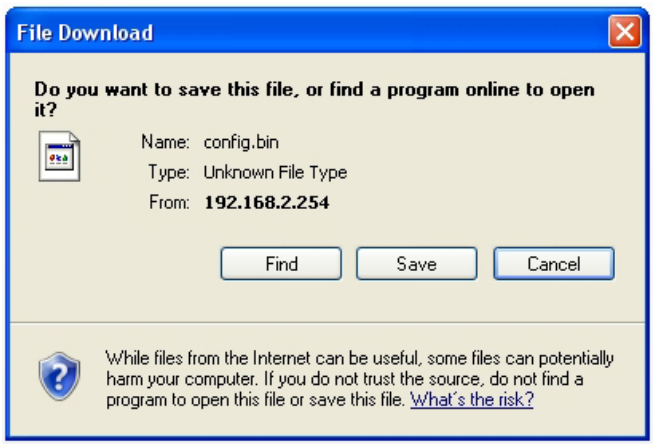
4.3.5 Backup / Restore and Reset to Factory

Current settings on the system can be backed up, or previous backed up settings can be restored as well as resetting the system back to factory default can be performed via this page.

Please click on **Utilities -> Profile Setting** and follow the below setting.


Profile Save
Profile Save
Save Settings To PC :
Save
Load Settings From PC :
Browse...
Upload
Reset To Factory Default :
Default
In this page, you can save your current configuration, restore a previously saved configuration, or reset all of the settings to the factory (default) settings.

- **Save Settings to PC :** Click ***Save*** button to save the current system settings to a local disk, i.e. the HDD of a local computer or Compact Disc.


File Download
Do you want to save this file, or find a program online to open it?
Name: config.bin
Type: Unknown File Type
From: 192.168.2.254
Find
Save
Cancel
While files from the Internet can be useful, some files can potentially harm your computer. If you do not trust the source, do not find a program to open this file or save this file. What's the risk?

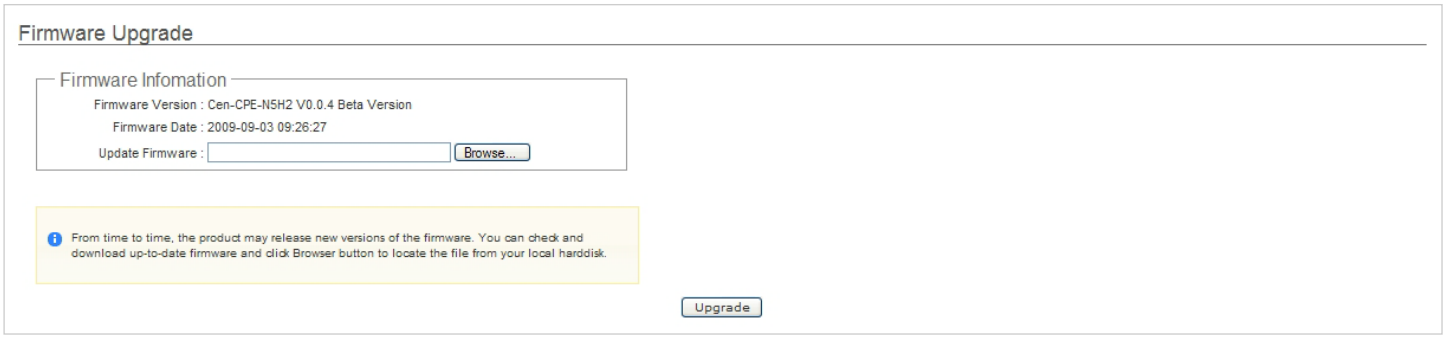
- **Load Settings from PC :** Click ***Browse*** button to search for a previously saved backup file, and then click ***Upload*** button to upload the settings; the system will then be configured to the same settings as specified by the backup file.

- **Reset To Factory Default :** Click ***Default*** button to load the factory default settings of "Air Force One 5", and then **Success Message** page appears. Click ***Reboot*** button to set default configuration.

4.3.6 Firmware Upgrade

Firmware is the main software image, which the system needs to perform all tasks in real time. Firmware upgrades are required for adding new features or to resolves bugs. It takes about **2 minutes** to upload/ upgrade flash and be patient please.

To upgrade the system firmware, click ***Browse*** to search for the new firmware file, and then click ***Upgrade*** button to execute the upgrade process.

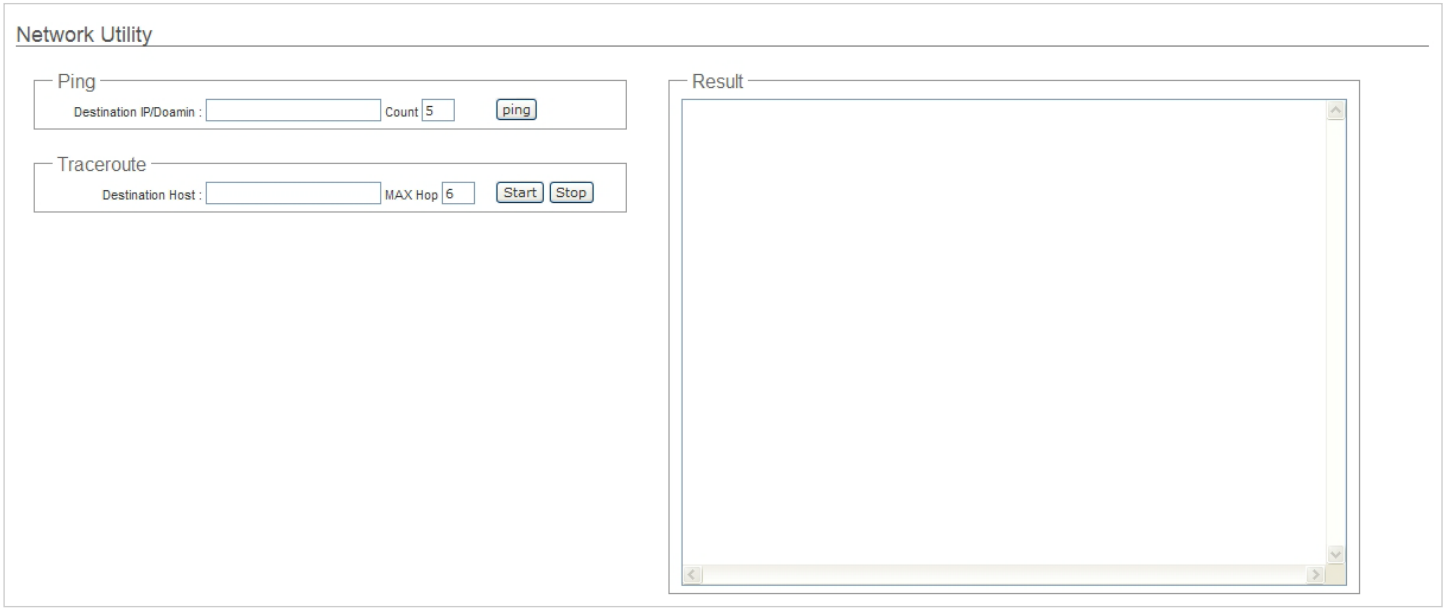

Firmware Upgrade
Firmware Infomation
Firmware Version : Cen-CPE-N5H2 V0.0.4 Beta Version
Firmware Date : 2009-09-03 09:26:27
Update Firmware :
Browse...
From time to time, the product may release new versions of the firmware. You can check and download up-to-date firmware and click Browser button to locate the file from your local harddisk.
Upgrade

1. *To prevent data loss during firmware upgrade, please back up the current settings before proceeding to firmware upgrade.*
2. *During the upgrading. Do not interrupt the system, i.e. power on/off, during the upgrading process or the restarting process as this may damage system.*

4.3.7 Network Utility

The administrator can diagnose the network connectivity via this function.

Please click on **Utilities -> Network Utility** and follow the below setting.



- **Ping :** This utility will ping other devices on the network directly form the “Air Force One 5” device.

  Ping utility should be used for the preliminary link quality and packet latency estimation between two network devices using the ICMP packets. Packet loss statistics and latency time evaluation is provided after the test is completed.

  - ➔ **Destination IP/Domain :** Enter the desired domain name or IP address of the target device for diagnosis purpose, i.e. www.google.com, and click ***ping*** button to proceed. The ping result will be shown in the **Result** field.
  - ➔ **Count :** Estimation is done after the number of ICMP packets; default is 5, maximum is 50.

- **Traceroute :** Allows tracing the hops from the “Air Force One 5” device to a selected outgoing IP address. It should be used for the finding the route taken by ICMP packets across the network to the destination host.

  - ➔ **Destination Host :** Specifies the Destination Host for the finding the route taken by ICMP packets across the network.
  - ➔ **MAX Hop :** Specifies the maximum number of hops(max time-to-live value) traceroute will probe.

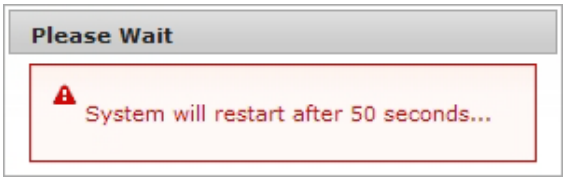
The test is started using the **Start** button, click Stop button to stopped test

4.3.8 Reboot

This function allows the administrator to safely restart the "Air Force One 5". Click ***Reboot*** to restart the system immediately, and the whole process will take about three minutes to complete.

Reboot
You must be reboot the system after changing settings. Rebooting the system will not delete any of your configuration settings. Click reboot button to reboot the system.
Reboot

The Pop-up Restart window as displayed below appears during the rebooting period. If turning off the power is necessary, please allow the restart process to be completed before turning off the system.



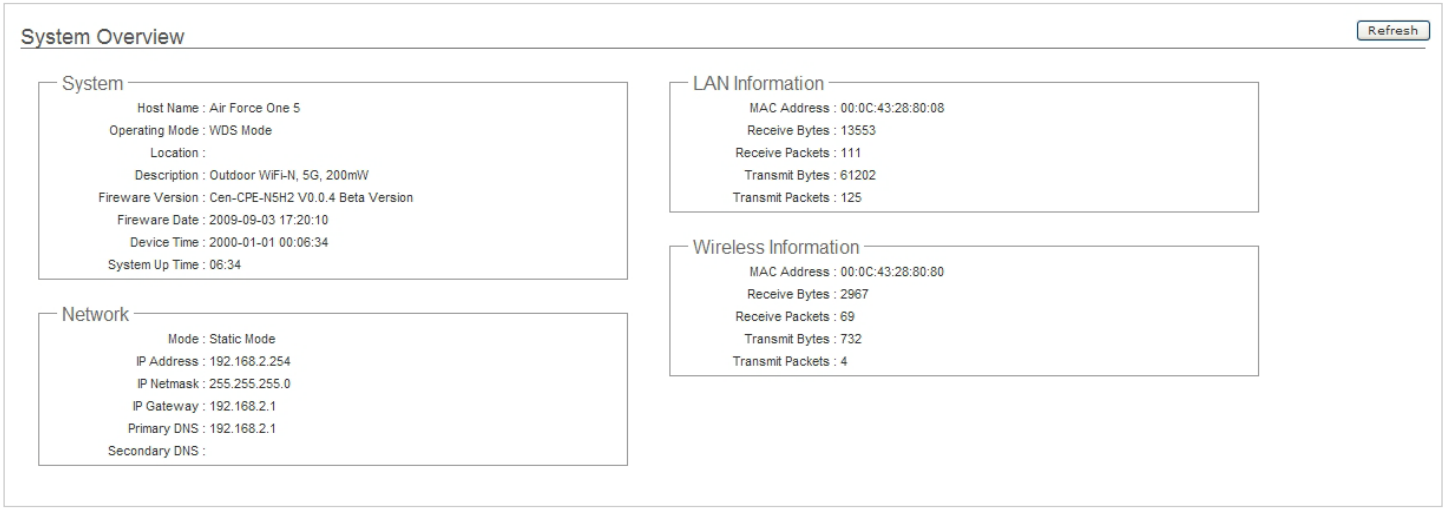
The **System Overview** page appears upon the completion of reboot.

4.4 Observer Status

Information of current system settings can be over viewed via this page; statuses of **Overview**, **WDS List**, **Extra Information** and **Event Log** are displayed in this interface.

4.4.1 System Overview

Detailed information on **System**, **Network**, **LAN Information** and **Wireless Information** can be reviewed via this page.



- **System :** Display the information of the system.
  - ➔ **System Name :** The name of the system.
  - ➔ **Operating Mode :** The mode currently in service.
  - ➔ **Location :** The reminding note on the geographical location of the system.
  - ➔ **Description :** The reminding note of the system.
  - ➔ **Firmware Version :** The current firmware version installed.
  - ➔ **Firmware Date :** The build time of the firmware installed.
  - ➔ **Device Time :** The current time of the system.
  - ➔ **System Up Time :** The time period that the system has been in service since last boot-up.

- **Network Information :** Display the information of the Network.

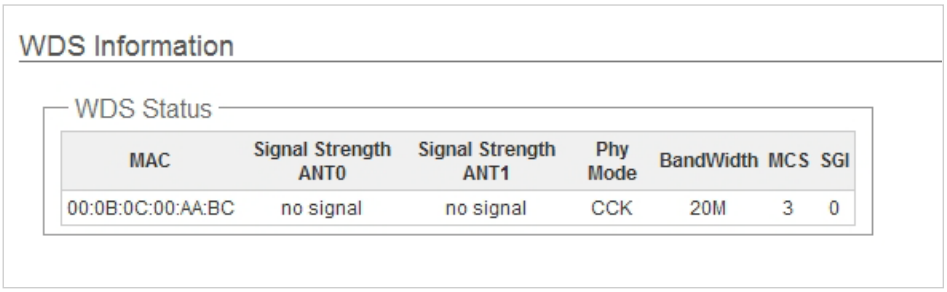
- ➔ **Mode :** The current mode of the LAN port.
- ➔ **IP Address :** The IP address of the LAN port.
- ➔ **IP Netmask :** The IP netmask of the LAN port.
- ➔ **IP Gateway :** The gateway IP address of the LAN port.
- ➔ **Primary DNS :** The current primary DNS server of the system.
- ➔ **Secondary DNS :** The current secondary DNS server of the system.

- **LAN Information :** Display the detailed receive and transmit statistics of LAN interface.
  - ➔ **MAC Address :** The MAC address of the LAN port.
  - ➔ **Receive bytes :**The current receive bytes of the LAN port.
  - ➔ **Receive packets :** The current receive packets of the LAN port.
  - ➔ **Transmit bytes :** The current transmit bytes of the LAN port.
  - ➔ **Transmit packets :** The current transmit packets of the LAN port.

- **Wireless Information :** Display the detailed receive and transmit statistics of Wireless interface.
  - ➔ **MAC Address :** The MAC address of the Wireless port.
  - ➔ **Receive bytes :**The current receive bytes of the Wireless port.
  - ➔ **Receive packets :** The current receive packets of the Wireless port.
  - ➔ **Transmit bytes :** The current transmit bytes of the Wireless port.
  - ➔ **Transmit packets :** The current transmit packets of the Wireless port.

4.4.2 WDS List

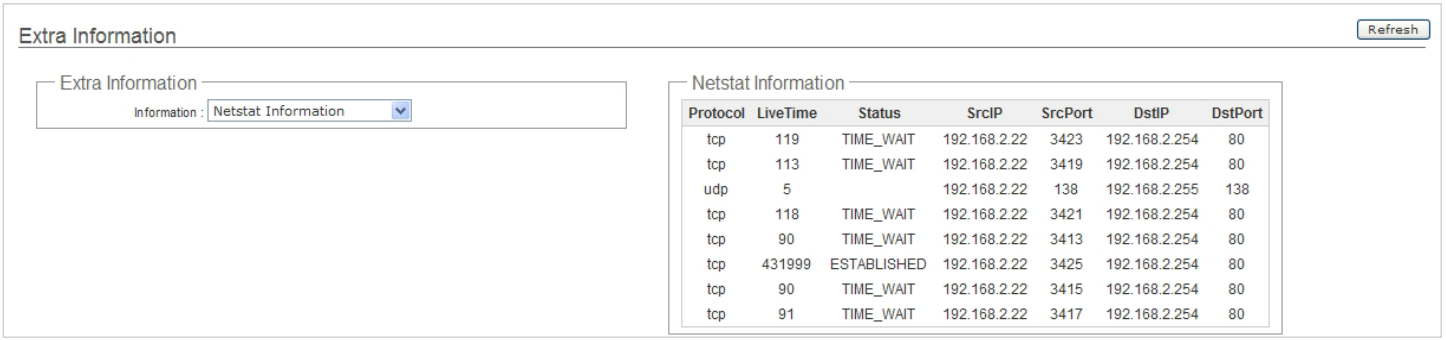
The administrator can obtain detailed Information such as MAC Address, Signal Strength of all WDS link via this page.



- **MAC :** Display MAC address of WDS peer.
- **Signal Strength ANT0/ANT1 :** Indicate the signal strength of the respective WDS linked.
- **Phy Mode :** Indicate the phy mode of the respective WDS linked.
- **BandWidth :** Indicate the channel bandwidth of the respective WDS linked.

*If Signal Strength ANT0/ANT1 display "**no signal**", you need check WDS configuration. Verify **MAC Address**, **Channel** and **Security type** is the same; also adjust system's antenna angle.*

4.4.3 Extra Information



Protocol	LiveTime	Status	SrcIP	SrcPort	DstIP	DstPort
tcp	119	TIME_WAIT	192.168.2.22	3423	192.168.2.254	80
tcp	113	TIME_WAIT	192.168.2.22	3419	192.168.2.254	80
udp	5		192.168.2.22	138	192.168.2.255	138
tcp	118	TIME_WAIT	192.168.2.22	3421	192.168.2.254	80
tcp	90	TIME_WAIT	192.168.2.22	3413	192.168.2.254	80
tcp	431999	ESTABLISHED	192.168.2.22	3425	192.168.2.254	80
tcp	90	TIME_WAIT	192.168.2.22	3415	192.168.2.254	80
tcp	91	TIME_WAIT	192.168.2.22	3417	192.168.2.254	80

The administrator can get current device usage statistics and status of the system components from drop-down list.

- **Show Netstat Information :** Select "**NetStatus Information**" on the drop-down list, the connection track list should show-up, the list can be updated using the Refresh button.

  NetStatus will show all connection track on the system, the information include *Protocol* , *Live Time* , *Status* , *Source/Destination IP address* and *Port*.

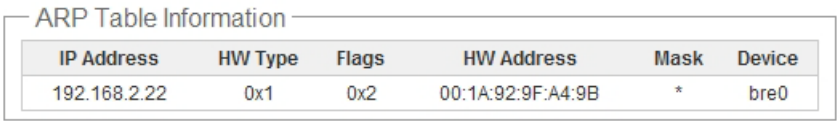
- **Show Route Information :** Select "**Route Information**" on the drop-down list, the route table should show-up, the list can be updated using the Refresh button.

  "Air Force One 5" examines the destination IP address of each data packet traveling through the system and chooses the appropriate interface to forward the packet to. The system choice depends on static routing rules – entries, which are registered in system routing table. Static routes to specific hosts, networks or default gateway are set up automatically according to the IP configuration of all the system's interfaces.

Route Information

Destination	Gateway	Genmask	Flags	Metric	Ref	Use	Iface
192.168.2.0	0.0.0.0	255.255.255.0	U	0	0	0	bre0
127.0.0.0	0.0.0.0	255.255.255.0	U	0	0	0	lo
0.0.0.0	192.168.2.1	0.0.0.0	UG	0	0	0	bre0

- **Show ARP Information :** Select "**ARP Table Information**" on the drop-down list, the ARP table should show-up, the list can be updated using the Refresh button.

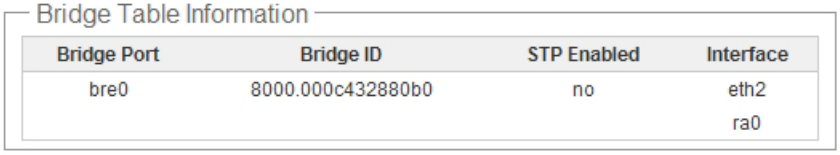

ARP Table Information

IP Address	HW Type	Flags	HW Address	Mask	Device
192.168.2.22	0x1	0x2	00:1A:92:9F:A4:9B	*	bre0

ARP is used to associate each IP address to the unique hardware address (MAC) the devices. It is important to have unique IP addresses for each MAC or else there will be ambiguous routes in the network.

- **Show Bridge Table Information :** Select "Bridge Table Information " on the drop-down list, the bridge table should show-up, the list can be updated using the Refresh button.

Bridge table will show Bridge ID and STP's Status on the each Ethernet bridge and its attached interfaces, the Bridge Port should be attached to some interfaces.


Bridge Table Information

Bridge Port	Bridge ID	STP Enabled	Interface
bre0	8000.000c432880b0	no	eth2
			ra0

- **Show MAC Information :** Select "**Bridge MACs Information**" on the drop-down list, all the list of MAC address should show up on the bridge table, the list can be updated using the Refresh button.

Bridge MACs shows to which Bridge Port the particular station is associated to - in other words from which Interface (Ethernet or wireless) the network device (defined by MAC address) is reachable to the system while forwarding the packets to that port only (thus saving a lot of redundant copies and transmits).

Ageing timer shows ageing time for each address entry (in seconds) - after particular time out, not having seen a packet coming from a certain address, the bridge will delete that address from the Bridge Table.

Bridge MACs Information

Port No	MAC Address	Local	Ageing Timer
1	00:0c:43:28:80:08	yes	0.00
2	00:0c:43:28:80:80	yes	0.00
1	00:1a:92:9f:a4:9b	no	0.03

- **Show STP Information :** Select "**Bridge STP Information**" on the drop-down list, all the list of STP information should show up on the STP table.

Bridge STP Information

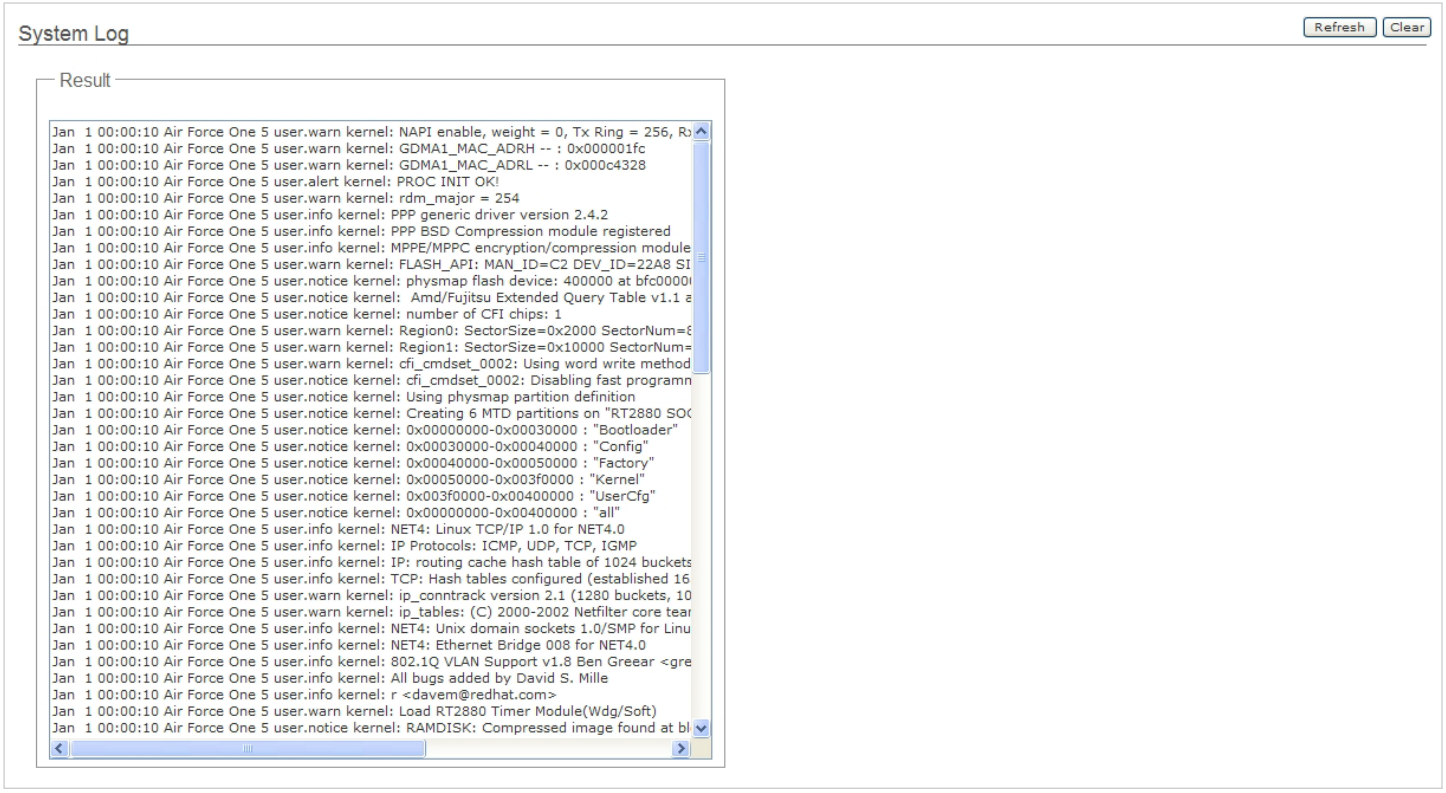
bre0			
bridge id	8000.000c43288008		
designated root	8000.000c43288008		
root port	0	path cost	0
max age	20.00	bridge max age	20.00
hello time	2.00	bridge hello time	2.00
forward delay	15.00	bridge forward delay	15.00
ageing time	300.00		
hello timer	0.84	tcn timer	0.00
topology change timer	0.00	gc timer	2.83
flags			

eth2 (1)			
port id	8001	state	forwarding
designated root	8000.000c43288008	path cost	100
designated bridge	8000.000c43288008	message age timer	0.00
designated port	8001	forward delay timer	0.00
designated cost	0	hold timer	0.85
flags			

ra0 (2)			
port id	8002	state	forwarding
designated root	8000.000c43288008	path cost	100
designated bridge	8000.000c43288008	message age timer	0.00
designated port	8002	forward delay timer	0.00
designated cost	0	hold timer	0.85
flags			

4.4.4 Event Log

The reported system events can be reviewed here.


System Log
Refresh
Clear
Result
Jan 1 00:00:10 Air Force One 5 user.warn kernel: NAPI enable, weight = 0, Tx Ring = 256, R
Jan 1 00:00:10 Air Force One 5 user.warn kernel: GDMA1_MAC_ADRH -- : 0x000001fc
Jan 1 00:00:10 Air Force One 5 user.warn kernel: GDMA1_MAC_ADRL -- : 0x000c4328
Jan 1 00:00:10 Air Force One 5 user.alert kernel: PROC INIT OK!
Jan 1 00:00:10 Air Force One 5 user.warn kernel: rdm_major = 254
Jan 1 00:00:10 Air Force One 5 user.info kernel: PPP generic driver version 2.4.2
Jan 1 00:00:10 Air Force One 5 user.info kernel: PPP BSD Compression module registered
Jan 1 00:00:10 Air Force One 5 user.info kernel: MPPE/MPPC encryption/compression module
Jan 1 00:00:10 Air Force One 5 user.warn kernel: FLASH_API: MAN_ID=C2 DEV_ID=22A8 SI
Jan 1 00:00:10 Air Force One 5 user.notice kernel: physmap flash device: 400000 at bfc0000
Jan 1 00:00:10 Air Force One 5 user.notice kernel: Amd/Fujitsu Extended Query Table v1.1 a
Jan 1 00:00:10 Air Force One 5 user.notice kernel: number of CFI chips: 1
Jan 1 00:00:10 Air Force One 5 user.warn kernel: Region0: SectorSize=0x2000 SectorNum=8
Jan 1 00:00:10 Air Force One 5 user.warn kernel: Region1: SectorSize=0x10000 SectorNum=
Jan 1 00:00:10 Air Force One 5 user.warn kernel: cfi_cmdset_0002: Using word write method
Jan 1 00:00:10 Air Force One 5 user.notice kernel: cfi_cmdset_0002: Disabling fast programn
Jan 1 00:00:10 Air Force One 5 user.notice kernel: Using physmap partition definition
Jan 1 00:00:10 Air Force One 5 user.notice kernel: Creating 6 MTD partitions on "RT2880 SO
Jan 1 00:00:10 Air Force One 5 user.notice kernel: 0x00000000-0x00030000 : "Bootloader"
Jan 1 00:00:10 Air Force One 5 user.notice kernel: 0x00030000-0x00040000 : "Config"
Jan 1 00:00:10 Air Force One 5 user.notice kernel: 0x00040000-0x00050000 : "Factory"
Jan 1 00:00:10 Air Force One 5 user.notice kernel: 0x00050000-0x003f0000 : "Kernel"
Jan 1 00:00:10 Air Force One 5 user.notice kernel: 0x003f0000-0x00400000 : "UserCfg"
Jan 1 00:00:10 Air Force One 5 user.notice kernel: 0x00000000-0x00400000 : "all"
Jan 1 00:00:10 Air Force One 5 user.info kernel: NET4: Linux TCP/IP 1.0 for NET4.0
Jan 1 00:00:10 Air Force One 5 user.info kernel: IP Protocols: ICMP, UDP, TCP, IGMP
Jan 1 00:00:10 Air Force One 5 user.info kernel: IP: routing cache hash table of 1024 buckets
Jan 1 00:00:10 Air Force One 5 user.info kernel: TCP: Hash tables configured (established 16
Jan 1 00:00:10 Air Force One 5 user.warn kernel: ip_conntrack version 2.1 (1280 buckets, 10
Jan 1 00:00:10 Air Force One 5 user.warn kernel: ip_tables: (C) 2000-2002 Netfilter core tear
Jan 1 00:00:10 Air Force One 5 user.info kernel: NET4: Unix domain sockets 1.0/SMP for Linu
Jan 1 00:00:10 Air Force One 5 user.info kernel: NET4: Ethernet Bridge 008 for NET4.0
Jan 1 00:00:10 Air Force One 5 user.info kernel: 802.1Q VLAN Support v1.8 Ben Greear <gre
Jan 1 00:00:10 Air Force One 5 user.info kernel: All bugs added by David S. Mille
Jan 1 00:00:10 Air Force One 5 user.info kernel: r <davem@redhat.com>
Jan 1 00:00:10 Air Force One 5 user.warn kernel: Load RT2880 Timer Module(Wdg/Soft)
Jan 1 00:00:10 Air Force One 5 user.notice kernel: RAMDISK: Compressed image found at bl

- **Date/ Time:** The date and time when the event occurred.
- **Hostname:** The name of the host which records the event. It helps the administrator identify the source of the reported events.
- **Process name (with square brackets):** Indicate the process with which the specific event is associated.
- **Description:** Description of the event.

Click ***Refresh*** button to renew the log, or click ***Clear*** button to clear all the record.

Chapter 5. CPE Mode Configuration

When CPE mode is activated, the system can be configured as a CPE. This section provides information in configuring the CPE mode with graphical illustrations. "Air Force One 5" provides functions as stated below where they can be configured via a user-friendly web based interface.

OPTION	System	Wireless	Advance	Utilities	Status
Functions	Operating Mode	General Setup	DMZ	Profiles Settings	System Overview
	WAN	Wireless Profile	IP Filter Setup	Firmware Upgrade	Station Statistics
	LAN	Site Survey	MAC Filter Setup	Network Utility	Extra Info
	DDNS Setup		Virtual Server	Reboot	Event Log
	Management		QoS		
	Time Server				
	UPNP				
	SNMP				

Table 5-1: CPE Mode Functions

5.1 External Network Connection

5.1.1 Network Requirement

It can be used as an Outdoor Customer Premises Equipment (CPE) to receive wireless signal over last mile applications, helping WISPs deliver wireless broadband Internet service to new residential and business customers. In this mode, the wireless interface of “Air Force One 5” (AFO-5) become WAN port, It is a gateway with NAT and DHCP Server functions. The wired clients of AFO-5 are in the different subnet from Main Base Station and it **does not** accept wireless connections from client devices.

The first step, you need to have one access point (Base Station) and connect it to Internet. Then, Connecting your PC/NB to the LAN port of “Air Force One 5” , **Figure 5-1** shows CPE mode configuration

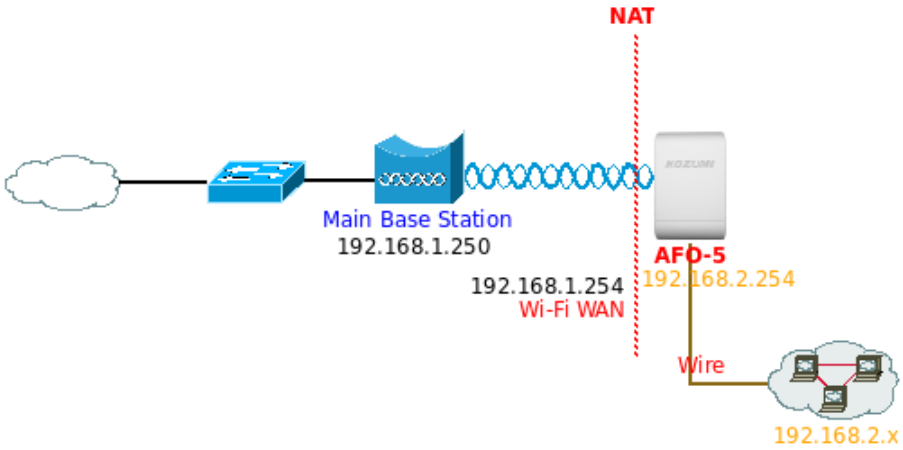
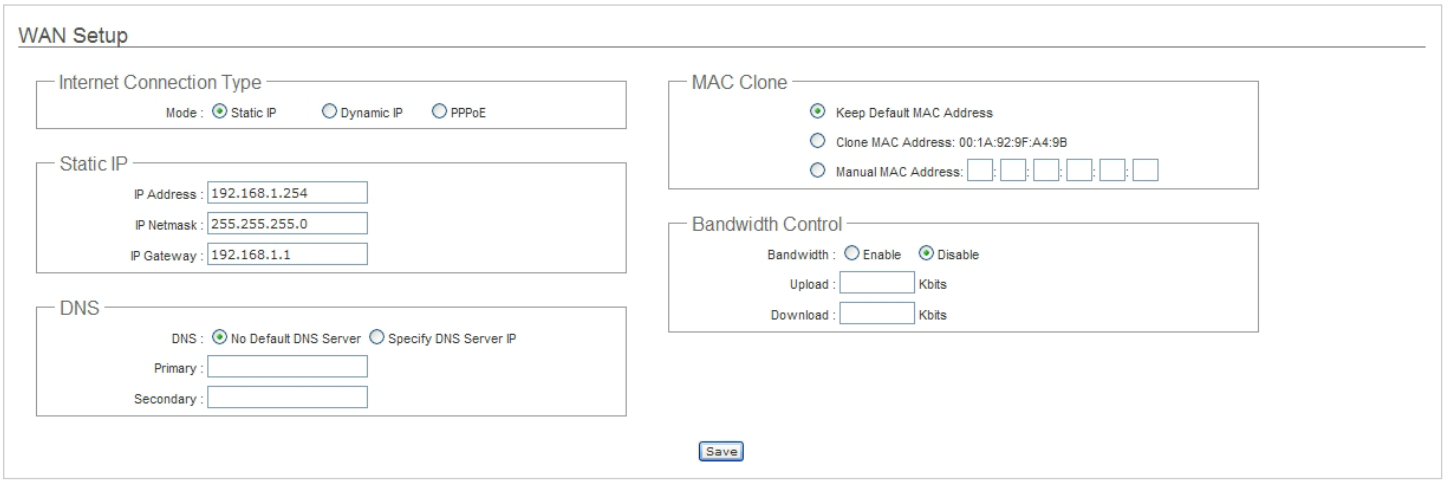


Figure 5-1 CPE mode configuration

5.1.2 Configure WAN Setup

Here is instruction for how to setup the WAN. There are three connection types for the WAN port : **Static IP**, **Dynamic IP** and **PPPoE**,



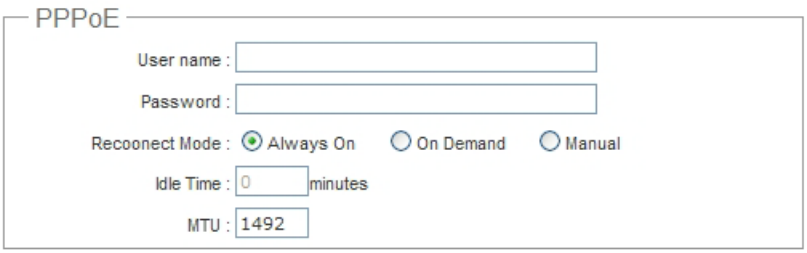
Please click on **System -> WAN** and follow the below setting.

On CPE mode, the WAN Port is Wireless interface.

- **Mode :** Check “Static IP”, “Dynamic IP” and “PPPoE” button as desired to set up the system IP of WAN port.
  - ➔ **Static IP :** The administrator can manually setup the WAN IP address when static IP is available/ preferred.
  - ➔ **IP Address :** The IP address of the WAN port; default IP address is 192.168.1.254
  - ➔ **IP Netmask :** The Subnet mask of the WAN port; default Netmask is 255.255.255.0
  - ➔ **IP Gateway :** The default gateway of the WAN port; default Gateway is 192.168.1.1
  - ➔ **Dynamic IP :** This configuration type is applicable when the "Air Force One 5" is connected to a network with the presence of a DHCP server; all related IP information will be provided by the DHCP server automatically. If the IP Address is not assigned from DHCP server, the system needs to be manually connect to DHCP server, Please go to “**WAN Information**” of the Overview page, click ***Release*** button to release IP address of WAN port, ***Renew*** button to renew IP address through DHCP server.

➔ **Hostname :** The Hostname of the WAN port

➔ **PPPoE :** This configuration type is applicable when the "Air Force One 5" is connected to a network with the presence of a PPPoE server.



➔ **User Name :** Enter User Name for PPPoE connection

➔ **Password :** Enter Password for PPPoE connection

➔ **Reconnect Mode :** There are three reconnect mode can be selected.

- ✓ **Always on** – A connection to Internet is always maintained.
- ✓ **On Demand** – A connection to Internet is made as needed.

*If **Time Server** is enabled on "On Demand" mode, it indicated the connection to Internet is always maintained*

- ✓ **Manual** – You have to open up the Web-based Management Interface and click the "Connect" button manually any time on "**WAN Information**" of the Overview page that you wish to connect to the Internet.

➔ **Idle Time :** The time of inactivity before disconnecting your PPPoE session. Enter an Idle Time (in minutes) to define a maximum period of time for which the Internet connect is maintained during inactivity. If the connection is inactive for longer than the defined Idle Time, then the connection will be dropped.

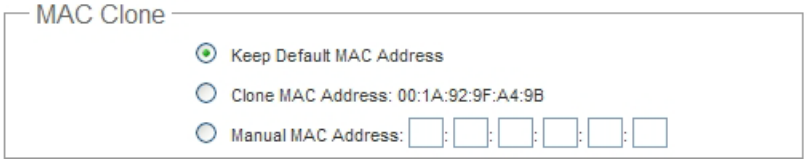
➔ **MTU :** MTU stands for Maximum Transmission Unit. For PPPoE connections, you may need to set the MTU setting in order to work correctly with your ISP. Default is 1492 bytes.

- **DNS :** Check either “No Default DNS Server” or “Specify DNS Server IP” button as desired to set up the system DNS.

  ➔ **Primary :** The IP address of the primary DNS server.

  ➔ **Secondary :** The IP address of the secondary DNS server.

- **MAC Clone :** The MAC address is a 12-digit code assigned to a unique piece of hardware for identification, like a social security number. Some ISPs require you to register a MAC address in order to access the Internet. If you do not wish to re-register the MAC address with your ISP, you may assign the MAC address you have currently registered with your ISP to the system using the MAC Address Clone feature.



➔ **Keep Default MAC Address :** Keep the default MAC address of WAN port on the system.

➔ **Clone MAC Address :** If you want to clone the MAC address of the PC you are currently using go configure the system, then click the **Clone MAC Address** button. The system will automatically detect your PC's MAC address.

The Clone MAC Address field will display MAC address of the PC you are connected with the system currently.

➔ **Manual MAC Address :** Enter the MAC address registered with your ISP.

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate

your changes

5.1.3 Configure DDNS Setup

Dynamic DNS allows you to make an assumed name as a dynamic IP address to a static hostname.

Please click on **System -> DDNS Setup** and follow the below setting.

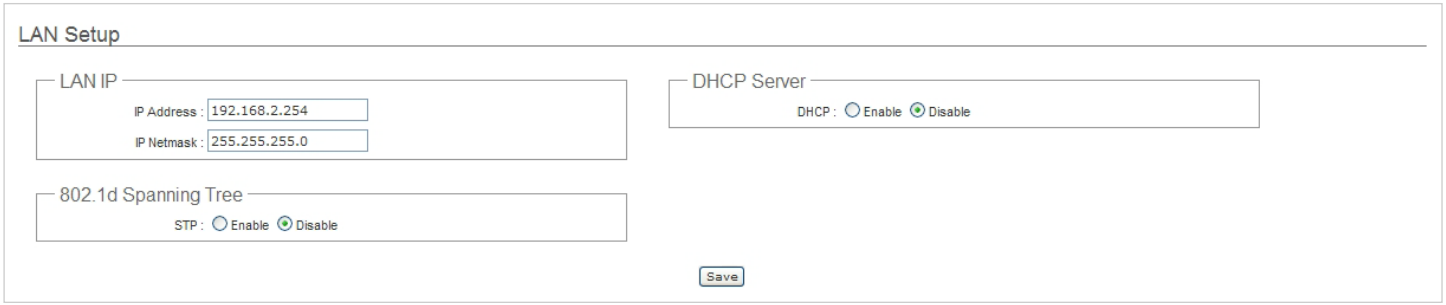
- **Enabled:** Select Enable for DDNS function, each time your IP address for WAN is changed, the information will be updated to DDNS service provider automatically.
- **Service Provider:** Select the correct Service Provider from the drop-down list, here included are *dyndns*, *dhs*, *ods* and *tzo* embedded in the "Air Force One 5".
- **Hostname:** This field represents the Host Name you register to Dynamic-DNS service and expect to export to the world.
- **User Name & Password:** User Name and Password is used as an identity to login DDNS service.

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes

5.1.4 LAN Setup

Here are the instructions for how to setup the local IP Address and Netmask.

Please click on **System -> LAN** and follow the below setting.

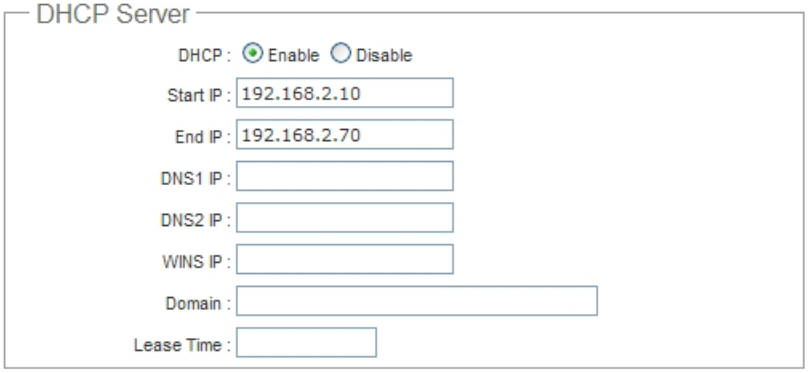


- **LAN IP :** The administrator can manually setup the LAN IP address.
  - ➔ **IP Address :** The IP address of the LAN port; default IP address is 192.168.2.254
  - ➔ **IP Netmask :** The Subnet mask of the LAN port; default Netmask is 255.255.255.0

- **802.1d Spanning Tree**

  The spanning tree network protocol provides a loop free topology for any bridged LAN. The Spanning Tree Protocol, which is also referred to as STP, is defined in the IEEE Standard 802.1d.

- **DHCP Setup :** Devices connected to the system can obtain an IP address automatically when this service is enabled.



- ➔ **DHCP :** Check ***Enable*** button to activate this function or ***Disable*** to deactivate this service.
- ➔ **Start IP / End IP:** Specify the range of IP addresses to be used by the DHCP server when assigning IP address to clients. The default range IP address is 192.168.2.10 to 192.168.2.70, the netmask is 255.255.255.0
- ➔ **DNS1 IP :** Enter IP address of the first DNS server; this field is required.
- ➔ **DNS2 IP :** Enter IP address of the second DNS server; this is optional.
- ➔ **WINS IP :** Enter IP address of the Windows Internet Name Service (WINS) server; this is optional.
- ➔ **Domain :** Enter the domain name for this network.
- ➔ **Lease Time :** The IP addresses given out by the DHCP server will only be valid for the duration specified by the lease time. Increasing the time ensure client operation without interruptions, but could introduce potential conflicts. Lowering the lease time will avoid potential address conflicts, but might cause more interruptions to the client while it will acquire new IP addresses from the DHCP server.

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes

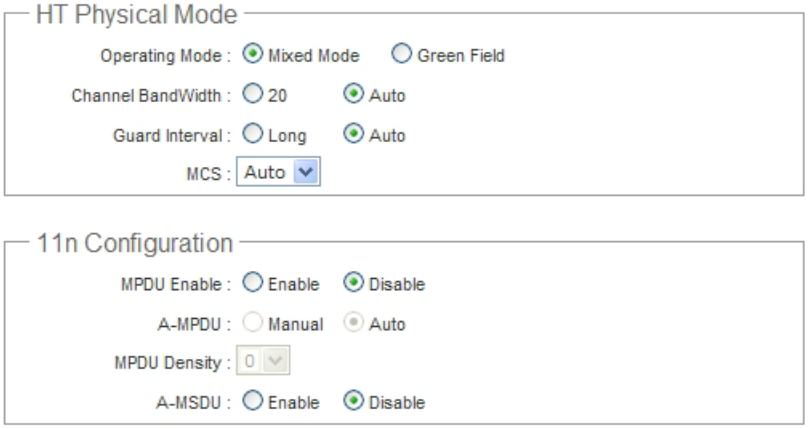
5.2 Access Point Association

5.2.1 Configure Wireless General Setting

The administrator can change the data transmission, channel and output power settings for the system. Please click on **Wireless -> General Setup** and follow the below setting.

- **Band Mode :** Select an appropriate wireless band; bands available are ***801.11a***or ***802.11a/n mixed mode***.
- **Country :** Select the desired country code from the drop-down list; the options are ***US***, ***ETSI***, ***JP*** and ***NONE***.
- **Transmit Rate Control :** Select the desired rate from the drop-down list; the options are auto or ranging from 1 to 54Mbps for **802.11a**
- **Tx Power :** You can adjust the output power of the system to get the appropriate coverage for your wireless network. Specify digit number between ***1*** to ***100*** (the unit is %) for your environment. If you are not sure of which setting to choose, then keep the default setting, 100%.

When **Band Mode** select in **802.11a/n mixed mode**, the **HT(High Throughput) Physical Mode and 11n Configuration** settings should be shown-up immediately.


HT Physical Mode
Operating Mode : Mixed Mode Green Field
Channel BandWidth : 20 Auto
Guard Interval : Long Auto
MCS : Auto
11n Configuration
MPDU Enable : Enable Disable
A-MPDU : Manual Auto
MPDU Density : 0
A-MSDU : Enable Disable

- **Operating Mode :**

  Mixed Mode : In this mode packets are transmitted with a preamble compatible with the legacy 802.11a/g, the rest of the packet has a new format. In this mode the receiver shall be able to decode both the Mixed Mode packets and legacy packets.

  Green Field : In this mode high throughput packets are transmitted without a legacy compatible part.

- **Channel Bandwidth :** The "**Auto**" MHz option is usually best. The other option is available for special circumstances.
- **Guard Interval :** Using "**Auto**" option can increase throughput. However, it can also increase error rate in some installations, due to increased sensitivity to radio-frequency reflections. Select the option that works best for your installation.
- **MCS :** This parameter represents transmission rate. By default (Auto) the fastest possible transmission rate will be selected. You have the option of selecting the speed if necessary.
- MPDU Enable : Check ***Enable*** button to activate this function, and ***Disable*** to deactivate.
- **A-MPDU** : A-MPDU (Aggregated Mac Protocol Data Unit) allows the transmissions of multiple Ethernet frames to a single location as burst of up to 64kbytes This is performed on the hardware itself. Select "Manual" to set "MPDU Density"
- **MPDU Density :** Minimum separation of MPDUs in an A-MPDU.

0	1	2	3	4	5	6	7
No Restriction	¼ µs	½ µs	1 µs	2 µs	4 µs	8 µs	16 µs

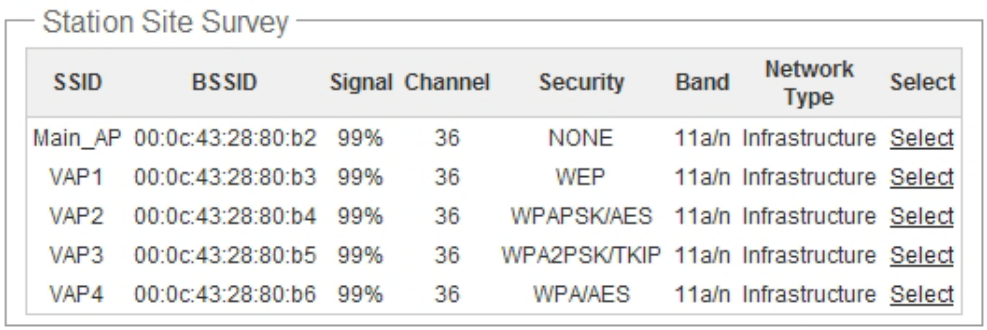
- **A-MSDU : Aggregated** Mac Service Data Unit, A-MSDU. Select **Enable** to allows aggregation for multiple MSDUs in one MPDU. Default is disabled.

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes.

5.2.2 Wireless Environment Scanning

Access points located around the system can be found via the scan function. The administrator can then select a desired AP to be associated with via this page.

Please click on **Wireless -> Site Survey**. Below depict an example for site survey.

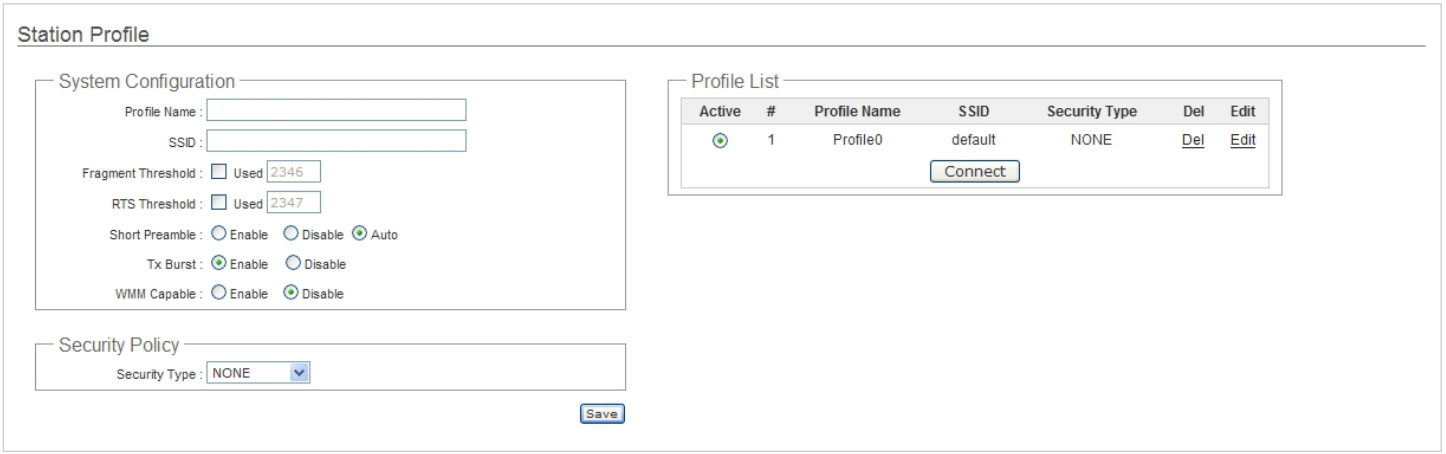

Station Site Survey
SSID BSSID Signal Channel Security Band Network Type Select
Main_AP 00:0c:43:28:80:b2 99% 36 NONE 11a/n Infrastructure Select
VAP1 00:0c:43:28:80:b3 99% 36 WEP 11a/n Infrastructure Select
VAP2 00:0c:43:28:80:b4 99% 36 WPAPSK/AES 11a/n Infrastructure Select
VAP3 00:0c:43:28:80:b5 99% 36 WPA2PSK/TKIP 11a/n Infrastructure Select
VAP4 00:0c:43:28:80:b6 99% 36 WPA/AES 11a/n Infrastructure Select

- **SSID :** Service Set ID of the AP or repeater found around the system.
- **BSSID :** MAC address of the respective AP.
- **Signal :** Indicate the signal strength of the respective AP.
- **Channel :** The channel number currently used by the respective AP.
- **Security :** Security type enabled by the respective AP.
- **Network Type :** Network type enabled by the respective AP.
- **Select:** Click “Select” to configure settings for associating with the respective AP.

*When you click “Select” on Station Site Survey Table, the system will copy “**ESSID**” and “**Security Type**” to Wireless Profile page. But, you also need setting some parameters (e.g. Profile Name or Security Key) on Wireless Profile page. About Wireless Profile setting, please see next section.*

5.2.3 Create Wireless Profile

The administrator can configure station profiles via this page.



Please click on **Wireless -> Wireless Profile** and follow the below setting.

- **Profile Name :** Create a profile name for the current wireless network connection. For different wireless network, set different profiles for quick connection uses.
- **SSID :** Service Set Identifier, which is unique name shared among all clients in a wireless network. It must be identical with your wireless router or access point's SSID settings.
- **Fragment Threshold :** The value specifies the maximum size of packet allowed before data is fragmented into multiple packets. Please use this value to tune the wireless connection if lots of retransmission happens. Enter a value ranging from **256** to **2346**.
- **RTS Threshold :** Tuning the Request to Send, RTS threshold will help the system control its access to medium and alleviate the hidden node problem. Enter a value ranging from **1** to **2347**.
- **Short Preamble :** The short preamble provides 56-bit Synchronization field to improve WLAN transmission efficiency. Check ***Enable*** button for using Short Preamble, and ***Disable*** for using the Long Preamble, 128-bit Synchronization field, option.
- **Tx Burst :** Click ***Enable*** button to activate Tx Burst, and ***Disable*** to deactivate Tx Burst. Enable the Tx Burst can increase transmission throughput.
- **WMM Capable :** Select Enable, the packets with QoS WMM will have higher priority.

- **Security Type :** Configure an appropriate security type for association, the Security Type can be select in "**NONE**", "**OPEN**", "**SHARED**", "**WPA-PSK**", or "**WPA2-PSK**" from drop-down list; the type needs to be the same as that associated access point.

  OPEN / SHARED : OPEN and SHARED require the user to set a WEP key to exchange data.

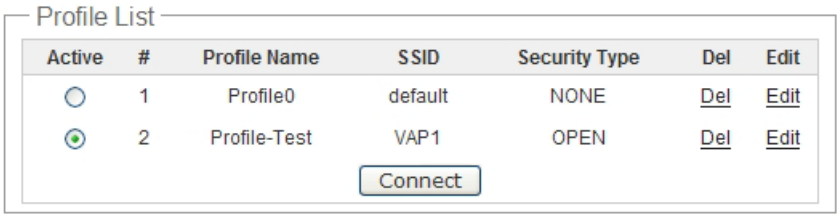
  - ✓ **Key Index :** Select key index used to designate the WEP key during data transmission. 4 different WEP keys can be configured at the same time, but only one is used. Effective key is set with a choice of WEP Key 1, 2, 3, or 4.
  - ✓ **WEP Key # :** Enter **HEX(10 or 26)** or **ASCII(5 or 13)** format WEP key value; the system support up to 4 sets of WEP keys.

➔ **WPA-PSK (or WPA2-PSK) :** WPA (or WPA2) Algorithms, allows the system accessing the network by using the WPA-PSK protected access.

  - ✓ **Cipher Suite :** Select the desired cipher suite from the drop-down list; the options are **AES** and **TKIP**
  - ✓ **Pre-shared Key :** Enter the information for pre-shared key; the key can be either entered as a 256-bit

secret in **64 HEX** digits format, or **8 to 63 ASCII** characters.

- **Profile List :** The user can manage the created profiles for home, work or public areas. Below depict an example for Profile List



➔ Click “”**Edit**” an exist profile on the Profile List. The field of System Configuration and Security Policy will display profile's content. Edit profile's content and then click “**Save**” button to save the profile.

➔ Click “**Del**” to remove profile.

➔ Click and Select a profile from list, then click the “**Connect**” button to connecting to the wireless network with the profile setting.

If you only click “Connect” button and does not click “Save” button. The selected profile would not be saved on the Profile List

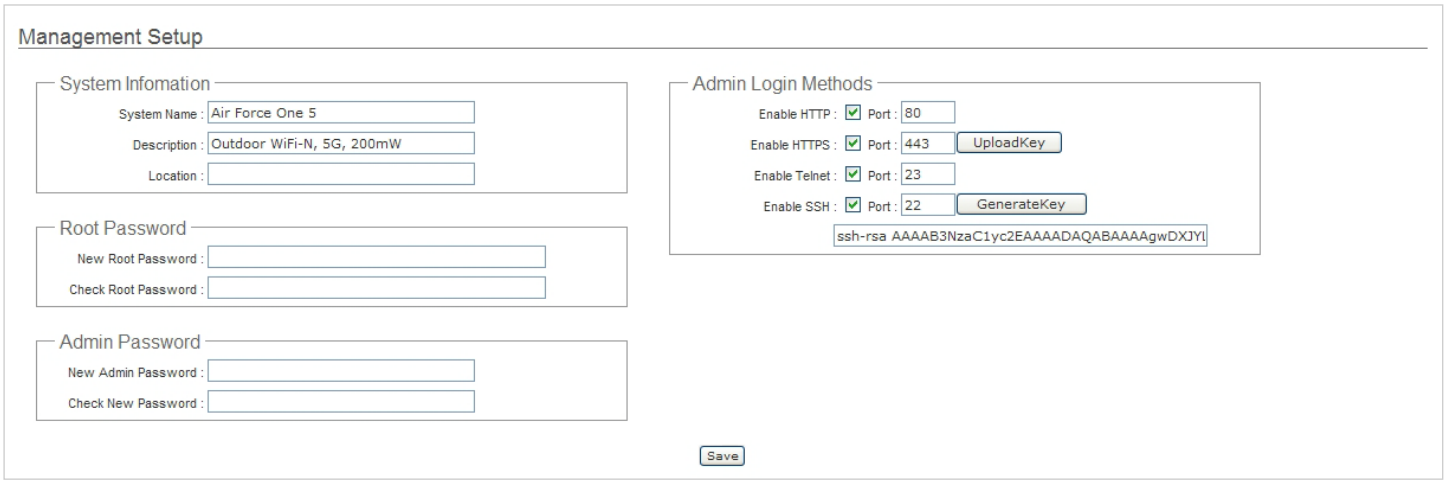
Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes

5.3 System Management

5.3.1 Configuration Management

The administrator can later obtain the geographical location of the system via the information configured here. The administrator also can change system password and configure system login methods.

Please click **System -> Management** and follow the below settings.



- **System Information**
  - ➔ **System Name :** Enter a desired name or use the default provided.
  - ➔ **Description :** Denote further information of the system.
  - ➔ **Location :** Enter related geographical location information of the system; administrator/manager will be able to locate the system easily.

The system supports **two** management accounts, root and admin. The system manager is assigned with full administrative privileges when logging in with the **root** account where the root manager can manage the system in any respect. However, when the system manager logs in via the **admin** account, only basic maintenance can be performed. Therefore, manager with different accounts will have different levels of privileges such as changing passwords; root manager can change passwords for both root account and admin account, however, admin manager can only maintain its own password. For more information on the respective privileges of these two management accounts, please refer to

Appendix C. System Manager Privileges.

- **Root Password :** The **root** manager can change its respective password. Enter the new password, and then verify the new password in the Check New Password filed. Click ***Save*** button to activate the new password.
  - ➔ **New Password :** Please input the new password of administrator.
  - ➔ **Check New Password :** Please input again the new password of administrator.
- **Admin Password :** The **admin** manager can change its respective password. Enter the new password, and then verify the new password in the Check New Password filed. Click ***Save*** button to activate the new password.
  - ➔ **New Password :** Please input the new password of administrator.
  - ➔ **Check New Password :** Please input again the new password of administrator.
- **Admin Login Methods :** The **root** manager can enable or disable system login methods, it can also change services port. Click ***Save*** button to activate the admin login methods.
  - ➔ **Enable HTTP :** Select Enable HTTP to activate HTTP Service
  - ➔ **HTTP Port :** Please input 1 ~ 65535 value to set HTTP Port; default value is 80
  - ➔ **Enable HTTPS :** Select Enable HTTPS to activate HTTPS Service
  - ➔ **HTTPS Port :** Please input 1 ~ 65535 value to set HTTPS Port; default value is 443

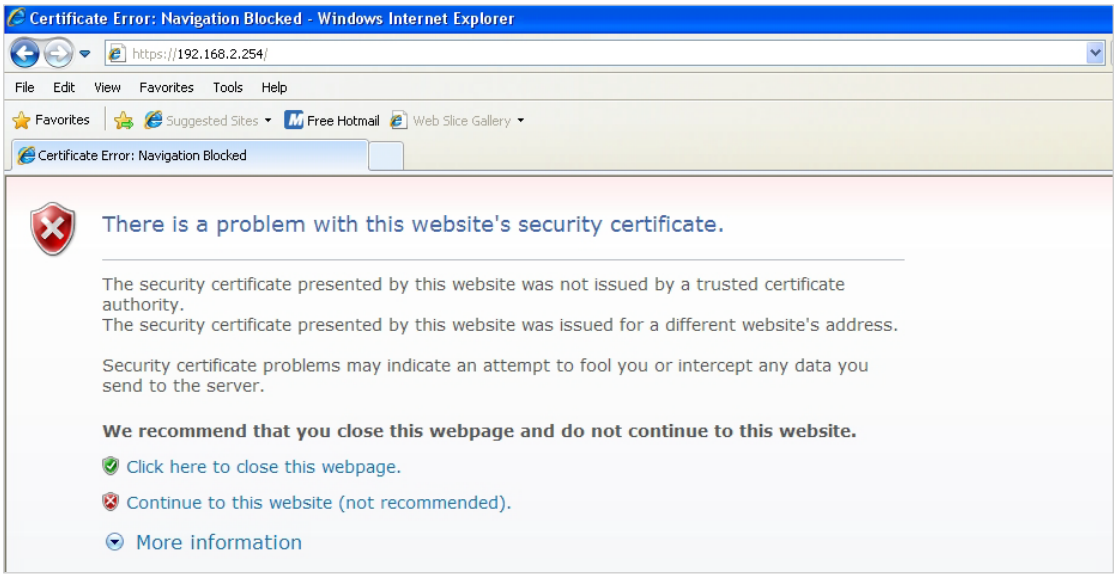
*If you already have an SSL Certificate, please click "**UploadKey**" button to select the file and upload it.*

  - ➔ **Enable Telnet :** Select Enable Telnet to activate Telnet Service
  - ➔ **Telnet Port :** Please input 1 ~ 65535 value to set Telnet Port; default value is 23
  - ➔ **Enable SSH :** Select Enable SSH to activate SSH Service
  - ➔ **SSH Port :** Please input 1 ~ 65535 value to set SSH Port; default value is 22

*Click "**GenerateKey**" button to generate RSA private key. The "Display the host key footprint" gray blank will be show content of RSA key.*

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes

Without a valid certificate, users may encounter the following problem in IE7 when they try to access system's WMI (https://192.168.2.254). There will be a “Certificate Error”, because the browser treats system as an illegal website.

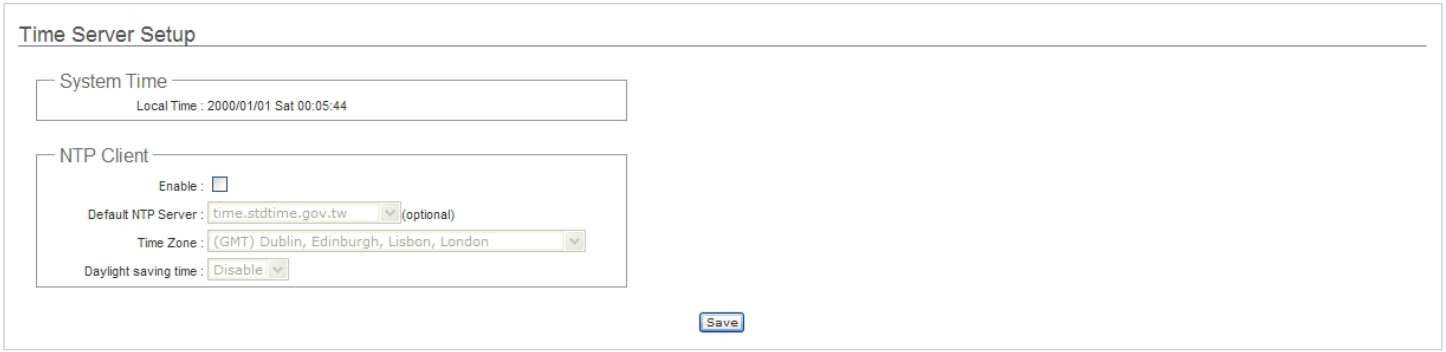

Certificate Error: Navigation Blocked - Windows Internet Explorer
https://192.168.2.254/
File Edit View Favorites Tools Help
Favorites
Suggested Sites
Free Hotmail
Web Slice Gallery
Certificate Error: Navigation Blocked
There is a problem with this website's security certificate.
The security certificate presented by this website was not issued by a trusted certificate authority.
The security certificate presented by this website was issued for a different website's address.
Security certificate problems may indicate an attempt to fool you or intercept any data you send to the server.
We recommend that you close this webpage and do not continue to this website.
Click here to close this webpage.
Continue to this website (not recommended).
More information

Click “***Continue to this website***” to access the system's WMI. The system's Overview page will appear.

5.3.2 Configure System Time

System time can be configured via this page where manual setting and NTP server configuration are both supported.

Please click on **System -> Time Server** and follow the below setting.



- **Local Time :** Display the current time of the system.

- **NTP Client :** Enable Network Time Protocol, NTP, to synchronize the system time with NTP server.

  ➔ **Default NTP Server :** Select the NTP Server from the drop-down list.

  ➔ **Time Zone :** Please set a time zone from where the accurate time can be supplied, **(GMT+08:00) Taipei** for example.

  ➔ **Daylight saving time :** Enable Daylight saving time from where the accurate time needed.

If the current time of the system is incorrect, please verify your network settings, like default Gateway and DNS settings

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes

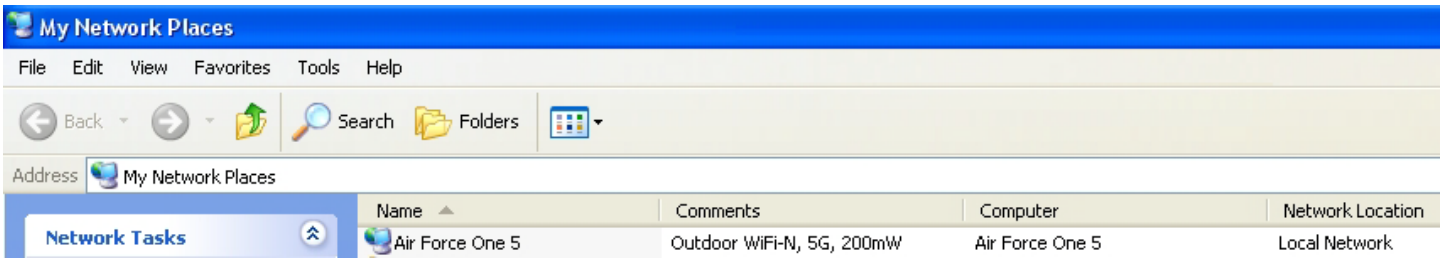
5.3.3 Configure UPnP

UPnP(Universal Plug and Play) is architecture for pervasive peer-to-peer network connectivity of PCs and intelligent devices or appliances, particularly within the home. UPnP builds on Internet standards and technologies, such as TCP/IP, HTTP, and XML, to enable these devices automatically connect with one another and work together to make networking – particularly home networking – possible for more people. Default: **Disable**.

- **UPnP :** Click "**Enable**" to activate UPnP Service or "**Disable**" to deactivate. The default is Disable.

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes

For UPnP to work in Windows XP, the "Air Force One 5" must be available in "***My Network Places***", as shown here: (your specific model may vary)

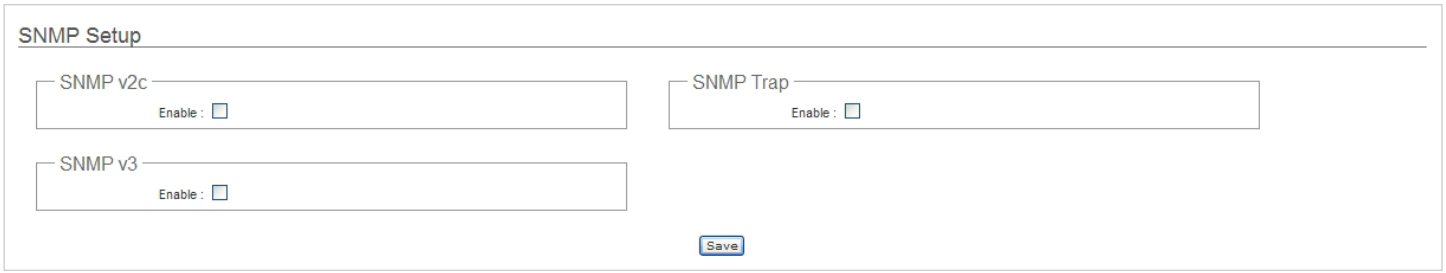


If these devices are not available, you should verify that the correct components and services are loaded in Windows XP. Please refer to ***Appendix D. Using UPnP on Windows XP***

5.3.4 Configure SNMP Setup

SNMP is an application-layer protocol that provides a message format for communication between SNMP managers and agents. By enabling SNMP function, the administrator can obtain the system information remotely.

Please click on **System -> SNMP Setup** and follow the below setting.



- **v2c :** Check “Enable” button to activate SNMP v2c agent or unchecked to deactivate this function.

  - ➔ **ro community :** Enter the community strings that allows read-only access to the system's SNMP information.
  - ➔ **rw community :** Enter the community strings that allows read/write access to the system's SNMP information.

- **v3 :** Check “Enable” button to activate SNMP v3 agent or unchecked to deactivate this function. SNMPv3 supports the highest available levels of security for SNMP communication.

- ➔ **SNMP ro user :** Enter the community strings that allows read-only access to the system's SNMP information.
- ➔ **SNMP ro password :** Enter the password that allows read-only access to the system's SNMP information.
- ➔ **SNMP rw user :** Enter the community strings that allows read/write access to the system's SNMP information.
- ➔ **SNMP rw password :** Enter the password that allows read/write access to the system's SNMP information.

■ **SNMP Trap :** Events on cold start, interface up & down, and association & disassociation can be reported via this function to an assigned server.

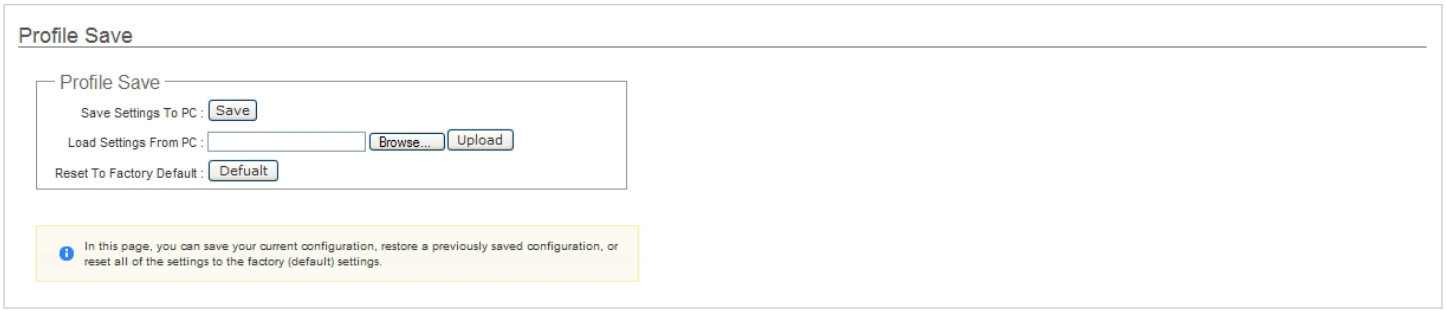
- ➔ **Community :** Enter the community strings required by the remote host computer that will receive trap messages or notices send by the system.
- ➔ **IP :** Enter the IP address of the remote host computer that will receive the trap messages.

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes

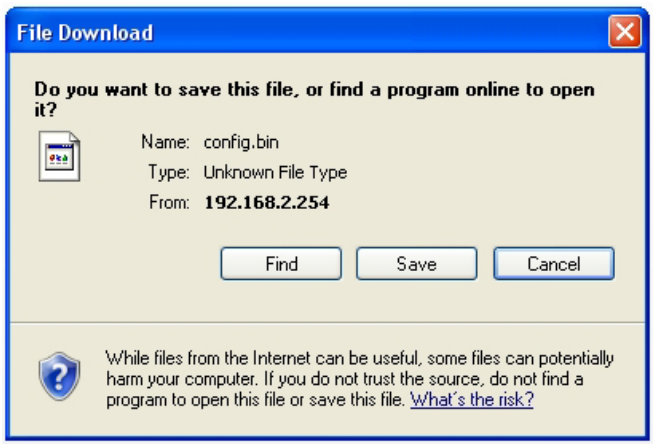
5.3.5 Backup / Restore and Reset to Factory

Current settings on the system can be backed up, or previous backed up settings can be restored as well as resetting the system back to factory default can be performed via this page.

Please click on **Utilities -> Profile Setting** and follow the below setting.


Profile Save
Profile Save
Save Settings To PC :
Save
Load Settings From PC :
Browse...
Upload
Reset To Factory Default :
Defualt
In this page, you can save your current configuration, restore a previously saved configuration, or reset all of the settings to the factory (default) settings.

- **Save Settings to PC :** Click ***Save*** button to save the current system settings to a local disk, i.e. the HDD of a local computer or Compact Disc.


File Download
Do you want to save this file, or find a program online to open it?
Name: config.bin
Type: Unknown File Type
From: 192.168.2.254
Find
Save
Cancel
While files from the Internet can be useful, some files can potentially harm your computer. If you do not trust the source, do not find a program to open this file or save this file. What's the risk?

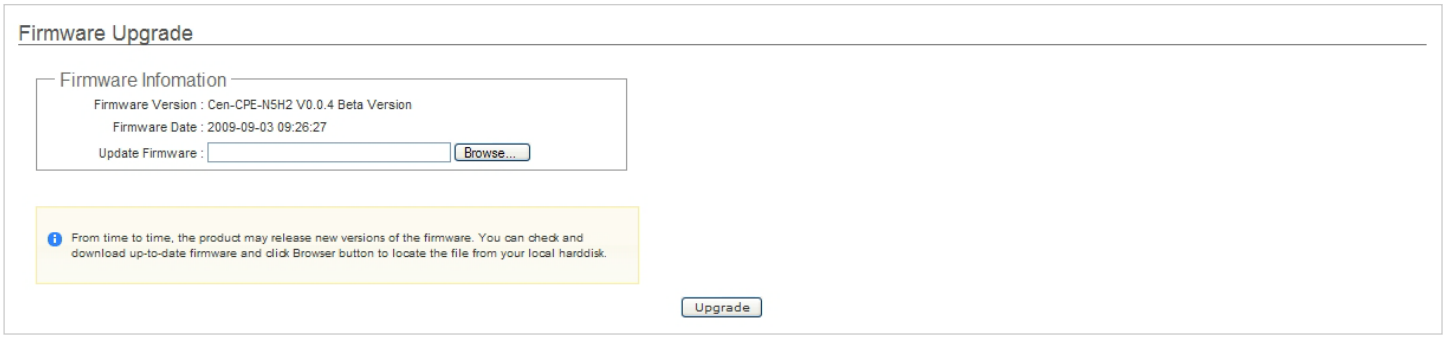
- **Load Settings from PC :** Click ***Browse*** button to search for a previously saved backup file, and then click ***Upload*** button to upload the settings; the system will then be configured to the same settings as specified by the backup file.

- **Reset To Factory Default :** Click ***Default*** button to load the factory default settings of "Air Force One 5", and then **Success Message** page appears. Click ***Reboot*** button to set default configuration.

5.3.6 Firmware Upgrade

Firmware is the main software image, which the system needs to perform all tasks in real time. Firmware upgrades are required for adding new features or to resolves bugs. It takes about **2 minutes** to upload/ upgrade flash and be patient please.

To upgrade the system firmware, click ***Browse*** to search for the new firmware file, and then click ***Upgrade*** button to execute the upgrade process.

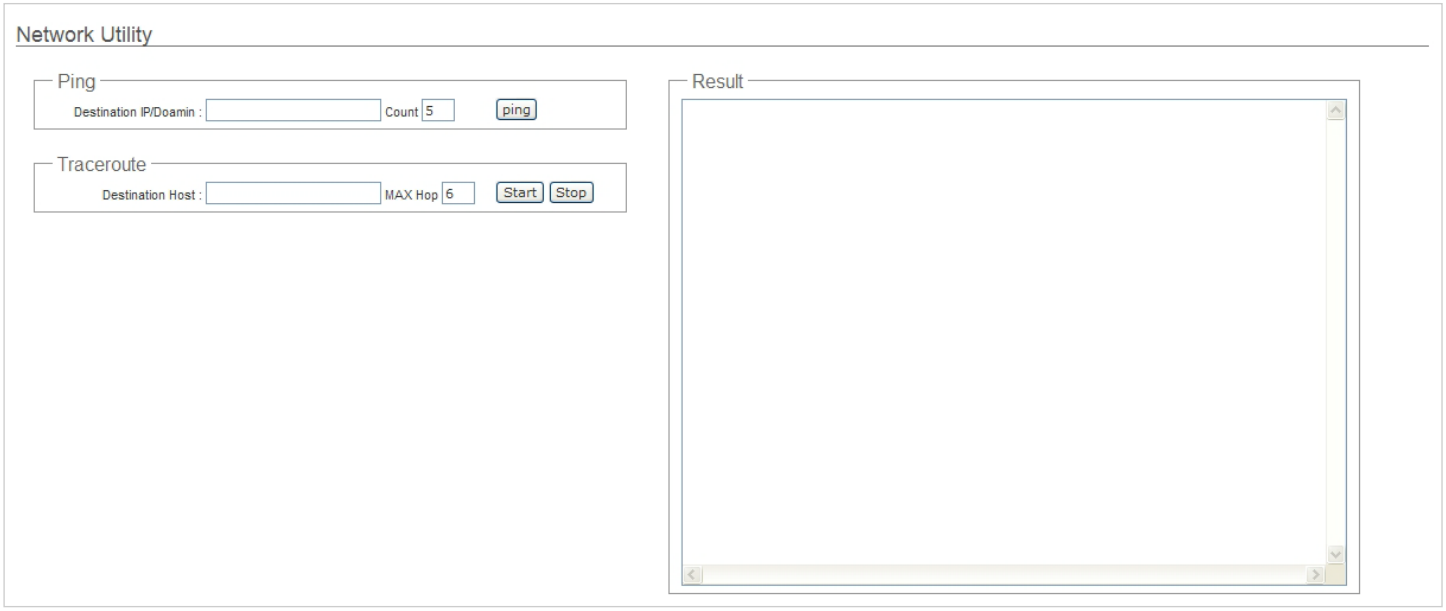

Firmware Upgrade
Firmware Infomation
Firmware Version : Cen-CPE-N5H2 V0.0.4 Beta Version
Firmware Date : 2009-09-03 09:26:27
Update Firmware :
Browse...
From time to time, the product may release new versions of the firmware. You can check and download up-to-date firmware and click Browser button to locate the file from your local harddisk.
Upgrade

1. *To prevent data loss during firmware upgrade, please back up the current settings before proceeding to firmware upgrade.*
2. *During the upgrading. Do not interrupt the system, i.e. power on/off, during the upgrading process or the restarting process as this may damage system.*

5.3.7 Network Utility

The administrator can diagnose the network connectivity via this function.

Please click on **Utilities -> Network Utility** and follow the below setting.



- **Ping :** This utility will ping other devices on the network directly form the “Air Force One 5” device.

  Ping utility should be used for the preliminary link quality and packet latency estimation between two network devices using the ICMP packets. Packet loss statistics and latency time evaluation is provided after the test is completed.

  - ➔ **Destination IP/Domain :** Enter the desired domain name or IP address of the target device for diagnosis purpose, i.e. www.google.com, and click ***ping*** button to proceed. The ping result will be shown in the **Result** field.
  - ➔ **Count :** Estimation is done after the number of ICMP packets; default is 5, maximum is 50.

- **Traceroute :** Allows tracing the hops from the “Air Force One 5” device to a selected outgoing IP address. It should be used for the finding the route taken by ICMP packets across the network to the destination host.

  - ➔ **Destination Host :** Specifies the Destination Host for the finding the route taken by ICMP packets across the network.
  - ➔ **MAX Hop :** Specifies the maximum number of hops(max time-to-live value) traceroute will probe.

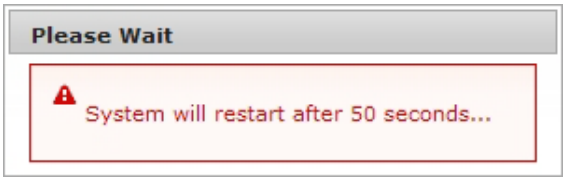
The test is started using the **Start** button, click Stop button to stopped test

5.3.8 Reboot

This function allows the administrator to safely restart the "Air Force One 5". Click ***Reboot*** to restart the system immediately, and the whole process will take about three minutes to complete.

Reboot
You must be reboot the system after changing settings. Rebooting the system will not delete any of your configuration settings. Click reboot button to reboot the system.
Reboot

The Pop-up Restart window as displayed below appears during the rebooting period. If turning off the power is necessary, please allow the restart process to be completed before turning off the system.



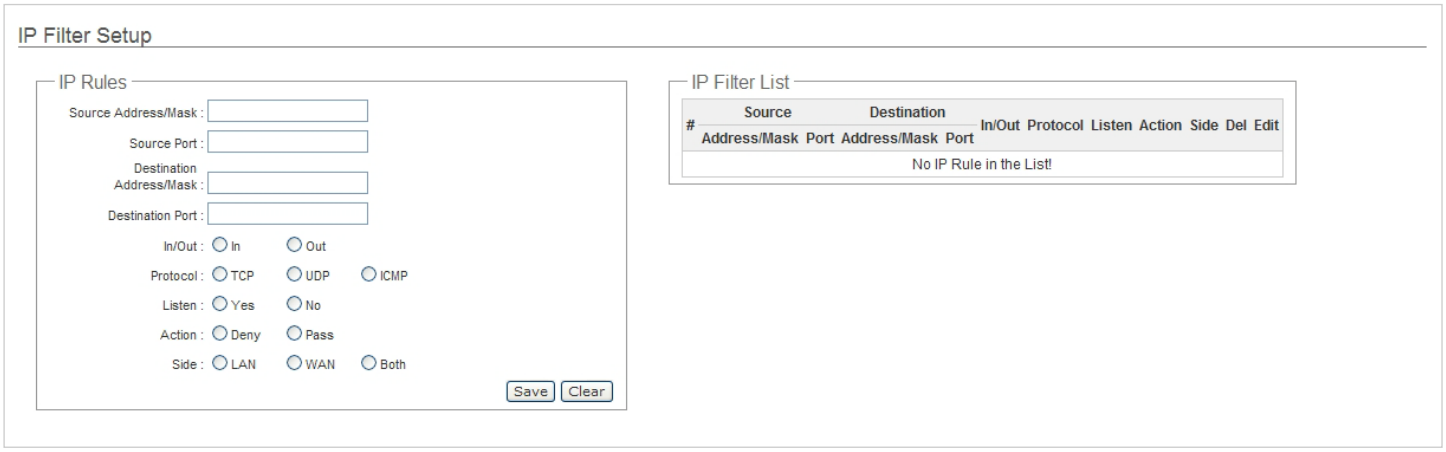
The **System Overview** page appears upon the completion of reboot.

5.4 Restrain Users

5.4.1 IP Filter Setup

IP filters deny or allow the use of specific protocols through the system's Wire (LAN) and Wireless (WAN) ports, and IP Address filters allow or deny the forwarding of unicast or multicast packets either sent from or addressed to specific IP Address. You can create a traffic to all addresses except those you specify. You can apply the filters you create to either or both Ethernet and radio ports and to either or both incoming and through packets. The administrator can set IP Filter via this page,

Please click on **Advance -> IP Filter Setup** and follow the below setting.


IP Filter Setup
IP Rules
Source Address/Mask :
Source Port :
Destination Address/Mask :
Destination Port :
In/Out : In Out
Protocol : TCP UDP ICMP
Listen : Yes No
Action : Deny Pass
Side : LAN WAN Both
Save Clear
IP Filter List
Source Address/Mask Port Destination Address/Mask Port In/Out Protocol Listen Action Side Del Edit
No IP Rule in the List!

- **Source Address/Mask :** Enter the desired source IP address and netmask; the mask must be a plain number, i.e. 192.168.2.10/32
- **Source Port :** The source port(s) required for this rule. A single port may be given, or a range may be given as ***start:end*** , which will match all ports from *start* to *end*, inclusive.
- **Destination Address/Mask :** Enter the desired destination IP address and netmask; the mask must be a plain number, i.e. 192.168.1.10/32
- **Destination Port :** The destination port(s) required for this rule. A single port may be given, or a range may be given as ***start:end*** , which will match all ports from *start* to *end*, inclusive.
- **In/Out :** This option used for specialized packet alteration. The system support In (INPUT : for packets coming into the interface itself) or Out (FORWARD : for altering packets being routed through the interface)

- **Protocol :** This option allows you to select protocol type. The system support ***TCP***, ***UDP*** or ***ICMP***.
- **Listen :** Enable ***Yes*** to match TCP packets only with the SYN flag.
- **Active :** Enter ***Deny*** to DROP specialized packet; ***Pass*** to ACCET the specialized packet
- **Side :** Select specified interface where filtering of the incoming /passing-through packets are processed.

When matching rule is on the list, it will follow rule. No matching rule is on the list, it will accept

Click "**Add**" button to add IP filter rule to List. There are **20** rules maximum allowed in this IP Filter List. All rules can be edited or removed on the List. Click ***Reboot*** button to activate your changes.

When you create rules on the IP Filter List, the previous rules have higher priority. If you want only one IP address accessing the system by telnet service from your network's subnet, and other IP address unable to use telnet access to the system. Below depict the examples for explaining priority of IP Filter setup.

- **Example 1 :** On this setting, there is only IP address 192.168.2.2 able use telnet access to system from LAN port.

Rule	Source		Destination		In/Out	Protocol	Listen	Action	Side
	IP/Mask	Port	IP/Mask	Port					
1	192.168.2.2/32		192.2.254/32	80	In	TCP	n	Deny	LAN
2	192.168.2.0/24		192.168.2.254/32	80	In	TCP	n	Deny	LAN

- **Example 2 :** On this setting, all of IP address 192.168.2.0 unable use telnet access to system from LAN port.

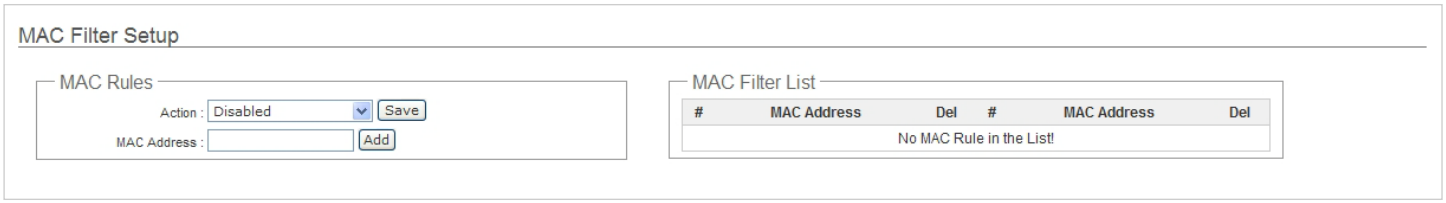
  Because rule 1's priority is higher than rule 2

Rule	Source		Destination		In/Out	Protocol	Listen	Action	Side
	IP/Mask	Port	IP/Mask	Port					
1	192.168.2.0/24		192.168.2.254/32	80	In	TCP	n	Deny	LAN
2	192.168.2.2/32		192.2.254/32	80	In	TCP	n	Deny	LAN

5.4.2 MAC Filter Setup

MAC address filters allow or deny the forwarding of unicast and multicast packets either sent from or addressed to specific MAC addresses. You can create a filter that passes traffic to all MAC address except those you specify, or you can create a filter that blocks traffic to all MAC addresses except those you specify. The administrator can set MAC Filter via this page,

Please click on **Advance -> MAC Filter Setup** and follow the below setting.


MAC Filter Setup
MAC Rules
Action : Disabled Save
MAC Address : Add
MAC Filter List
MAC Address Del # MAC Address Del
No MAC Rule in the List!

- **Action :** Select the desired access control rule from the drop-down list; the options are "**Disabled**", "**Deny List MAC**" and "**Allow List MAC**". Click "**Save**" button to save Action setting.

  There are two ways to set the Access Control List :

  ➔ **Action** is set to **Deny List MAC**.

  The MAC address in the MAC Filter List will be **denied** access to WAN port and all the remaining MAC will be **granted**

  ➔ **Action** is set to **Allow List MAC**.

  The MAC address in the MAC Filter List will be **allowed** access to WAN port and all the remaining MAC will be **denied**

- **MAC Address :** Enter MAC address in this field. The acceptable format are xxxxxxxxxxxx or xx:xx:xx:xx:xx:xx 12 hex digit number.

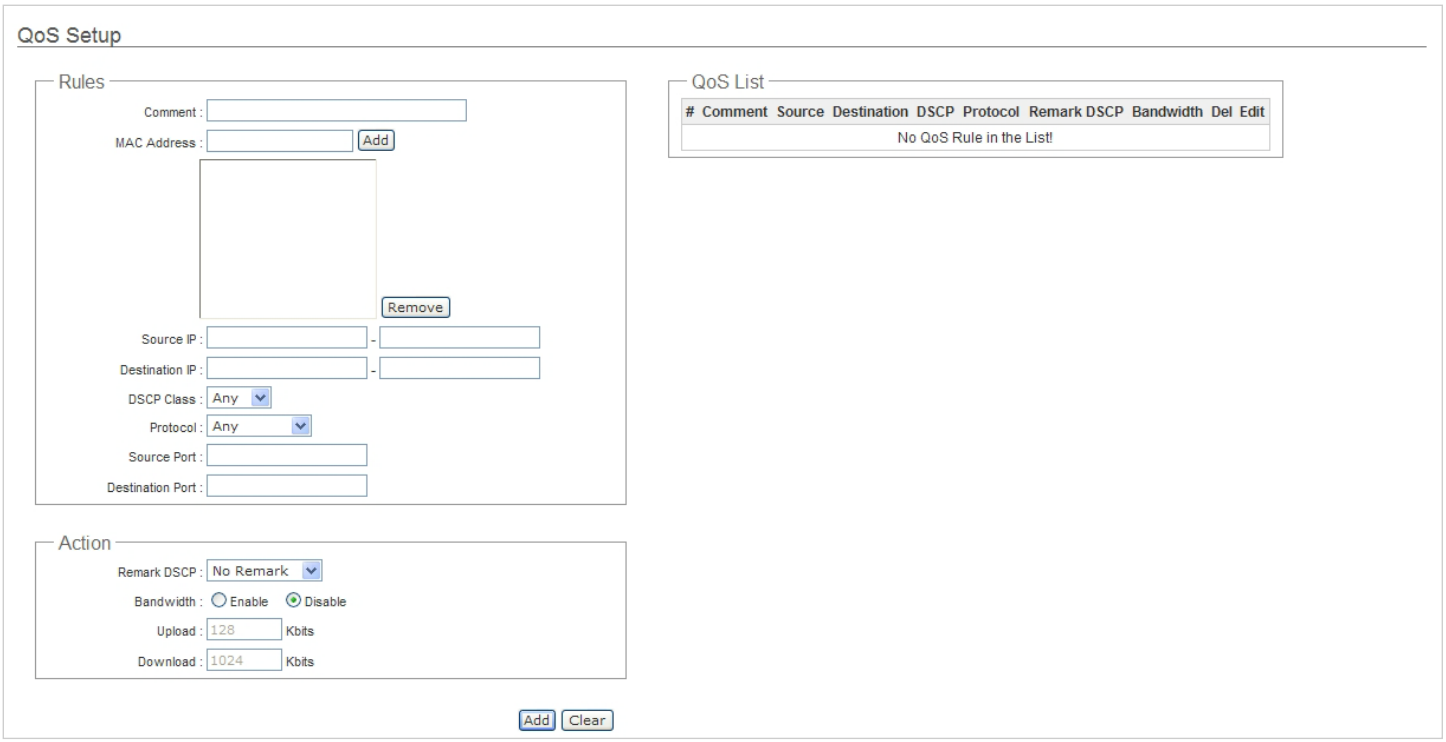
Click "**Add**" button to add MAC filter rule to List. There are **20** rules maximum allowed in this MAC Filter List. All rules can

be removed on the List. Click ***Reboot*** button to activate your changes.

5.4.3 QoS Setup

Quality of Service (QoS) refers to both a network's ability to deliver data with minimum delay, and the networking methods used to control the use of bandwidth. Without QoS, all traffic data is equally likely to be dropped when the network is congested. This can cause a reduction in network performance and make the network inadequate for time-critical application such as video-on-demand.

A classifier groups traffic into data flows according to specific criteria such as the source address, destination address, source port number, destination port number or incoming port number. For example, you can configure a classifier to select traffic from the same protocol port (such as FTP) to form a flow.



- **Rules :** Use the rules to define the classifiers. After you define the rules, you can specify action to act upon the traffic that matches the rules.
  - ➔ **Comment :** Enter a descriptive name for this rule for identifying purposes.
  - ➔ **MAC Address :** Enter MAC address in valid MAC address format(xx:xx:xx:xx:xx:xx) and click "**Add**" button to add in the MAC group of each rule. Click "**Remove**" button can remove MAC address in the group of each rule. There are **10** MAC address maximum allowed in each rule.
  - ➔ **Source / Destination IP :** Specify source/ destination IP addresses range required for this rule. If you specify

source IP addresses range from 192.168.1.1 to 192.168.2.254. The matches a range of source IP addresses include every single IP address from the first to the last, so the example above includes everything from 192.168.1.1 to 192.168.2.254.

➔ **DSCP Class** : Differentiated services code point, DSCP. Select Any or specify classify traffic from drop-down list. The Per-Hop Behavior (PHB) is indicated by encoding a 6-bit value—called the Differentiated Services Code Point (DSCP)—into the 8-bit Differentiated Services (DS) field of the IP packet header. Below depicts class for DSCP.

- ✓ **BE :** *Default* PHB, which is typically best-effort traffic
- ✓ **EF :** *Expedited Forwarding* PHB, dedicated to low-loss, low-latency traffic
- ✓ **AF :** *Aaaured Forwarding* PHB, which gives assurance of delivery under conditions. The AF behavior group defines four separate AF classes. Within each class, packets are given a drop precedence (high, medium or low). The combination of classes and drop precedence yields twelve separate DSCP encodings from **AF11** through **AF43** (see table)

DROP Precedence	**Class 1**	**Class 2**	**Class 3**	**Class 4**
Low Drop	AF11	AF21	AF31	AF41
Medium Drop	AF12	AF22	AF32	AF42
High Drop	AF13	AF23	AF33	AF43

➔ **Protocol :** Select **Any** or specify protocol from drop-down list. When you select **ICMP** or **Layer 7 Application** , the Source/ Destination Port can not used.

➔ **Source Port :** Specify source port range required for this rule

➔ **Destination Port :** Specify destination port range required for this rule

■ **Action :** After configuring rule, a policy rule ensures that a traffic flow gets the requested treatment in the network.

➔ **Remark DSCP :** Specify a new DSCP class, if you want to replace or remark the DSCP

➔ **Bandwidth :** Click "**Enable**" to activate function, and click "**Disable**" to deactivate function

➔ **Upload / Download :** Specify the bandwidth in kilobit per second (Kbps). Enter a number between **8** to **8192**, default upload is **128** Kbps, download is **1024** Kbps.

Click “**Add**” button to add QoS rule to List. There are **10** rules maximum allowed in this QoS List. All rules can be removed or edited on the List. Click ***Reboot*** button to activate your changes.

When you create rules on the QoS List, the previous rules have higher priority. . Below depict the examples for explaining priority of QoS setup.

- **Example 1 :** On this setting, the FTP has **1024** Kbps upload and **8196** Kbps download on **192.168.2.10**. The other protocol only can use **512** Kbps bandwidth on each IP address. Because rule 1's priority is higher than rule 2

Rule	Source IP	Destination IP	DSCP	Protocol	Remark DSCP	Bandwidth (Up/Down)
1	192.168.2.10		ANY	FTP	NO	1024/8196
2			ANY	ANY	NO	512/512

- Example 2 : On this setting, the FTP has **512** Kbps upload and **512** Kbps download on **192.168.2.10** Because rule 1's priority is higher than rule 2

Rule	Source IP	Destination IP	DSCP	Protocol	Remark DSCP	Bandwidth (Up/Down)
1			ANY	ANY	NO	512/512
2	192.168.2.10		ANY	FTP	NO	1024/8196

5.5 Internal Service Sharing

5.5.1 DMZ

The Demilitarized zone (DMZ) can be enabled and used as a place where services can be placed such as Web Servers, Proxy Servers, and E-mail Servers, these services can still serve the local network and at the same time isolate it for additional security. *DMZ* is commonly used with the *NAT* functionality as an alternative for the *Virtual Server (IP / Port Forwarding)* while making all the ports of the host network devices visible from the external network side. Please click on **Advance -> DMZ** and follow the below setting.

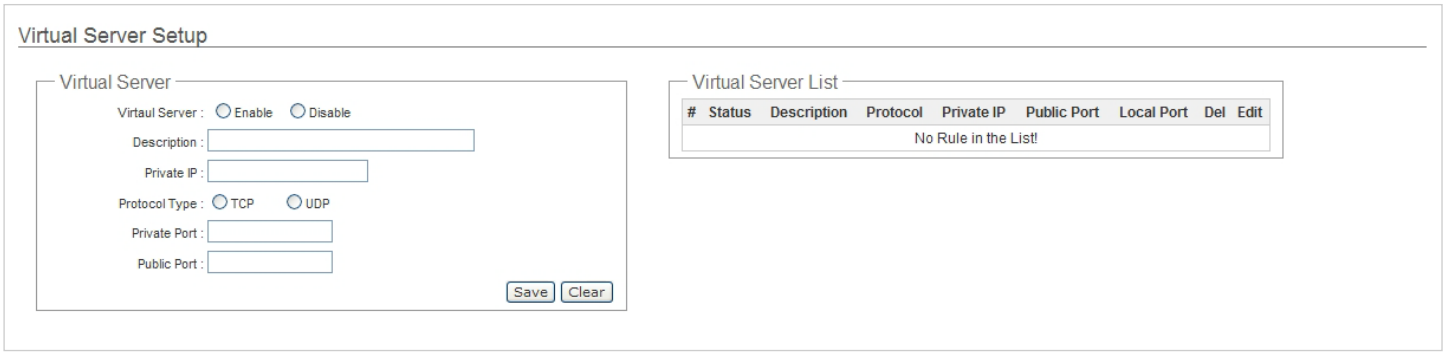
- **DMZ :** Check ***Enable*** button to activate this function, and ***Disable*** to deactivate.
- **IP Address :** Enter the IP address of the computer or server to be used as DMZ host; only one DMZ host can be activate at any time period.

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes.

5.5.2 Virtual Server (IP/ Port Forwarding)

A certain area in the network can be exposed to the Internet in a limited and controlled way for on-line game or video conferencing via this page. Please ensure the internal port to be used is not occupied by other applications.

Please click on **Advance -> Virtual Server** and follow the below setting.


Virtual Server Setup
Virtual Server
Virtaul Server : Enable Disable
Description :
Private IP :
Protocol Type : TCP UDP
Private Port :
Public Port :
Save Clear
Virtual Server List
Status Description Protocol Private IP Public Port Local Port Del Edit
No Rule in the List!

- **Virtual Server :** Check ***Enable*** button to activate this rule, and ***Disable*** to deactivate.
- **Description :** Enter appropriate text to denote name of the Virtual server.
- **Private IP :** The corresponding IP address of the LAN port used for the respective service. Enter the LAN IP address of the assigned host.
- **Protocol Type :** The communication protocol of session. Select an appropriate protocol type, either TCP or UDP protocol.
- **Private Port :** The private port(s) required for this rule. A single port may be given, or a range may be given as ***start:end*** , which will match all ports from *start* to *end*, inclusive.
- **Public Port :** The public port(s) required for this rule. A single port may be given, or a range may be given as *start:end* , which will match all ports from *start* to *end*, inclusive.

The Private Port and Public Port can be different, but the port range needs to be the same.
example : Public Port is 10 to 20, the Private Port can be 30 to 40 or other 10 ports range.

Click “**Add**” button to add Virtual Server rule to List. There are a maximum of **20** rules allowed in this List. All rules can be edited or removed on the List. Click ***Reboot*** button to activate your changes.

When you create rules on the Virtual List, the previous rules have higher priority. If you enable DMZ function. The Virtual server has higher priority than DMZ. Below depict the examples for explaining priority of Virtual Server setup.

- **Example 1 :** On this setting, all connections should be redirected to **192.168.2.12**. But connections to port ***20~80/tcp*** should be redirected to port ***20~80*** on ***192.168.2.11***, and connections to port ***22/tcp*** should be redirected to port ***22*** on ***192.168.2.10***

Rule	Protocol	Private IP	Private Port	Public Port
1	TCP	192.168.2.10	22	22
2	TCP	192.168.2.11	20:80	20:80

DMZ Enabled : 192.168.2.12

- **Example 2 :** On this setting, On this setting, all connections should be redirected to **192.168.2.12**. But connections to port ***20~80/tcp*** should be redirected to port ***20~80*** on ***192.168.2.11***. The rule 2 does not availability.

Rule	Protocol	Private IP	Private Port	Public Port
1	TCP	192.168.2.11	20:80	20:80
2	TCP	192.168.2.10	22	22

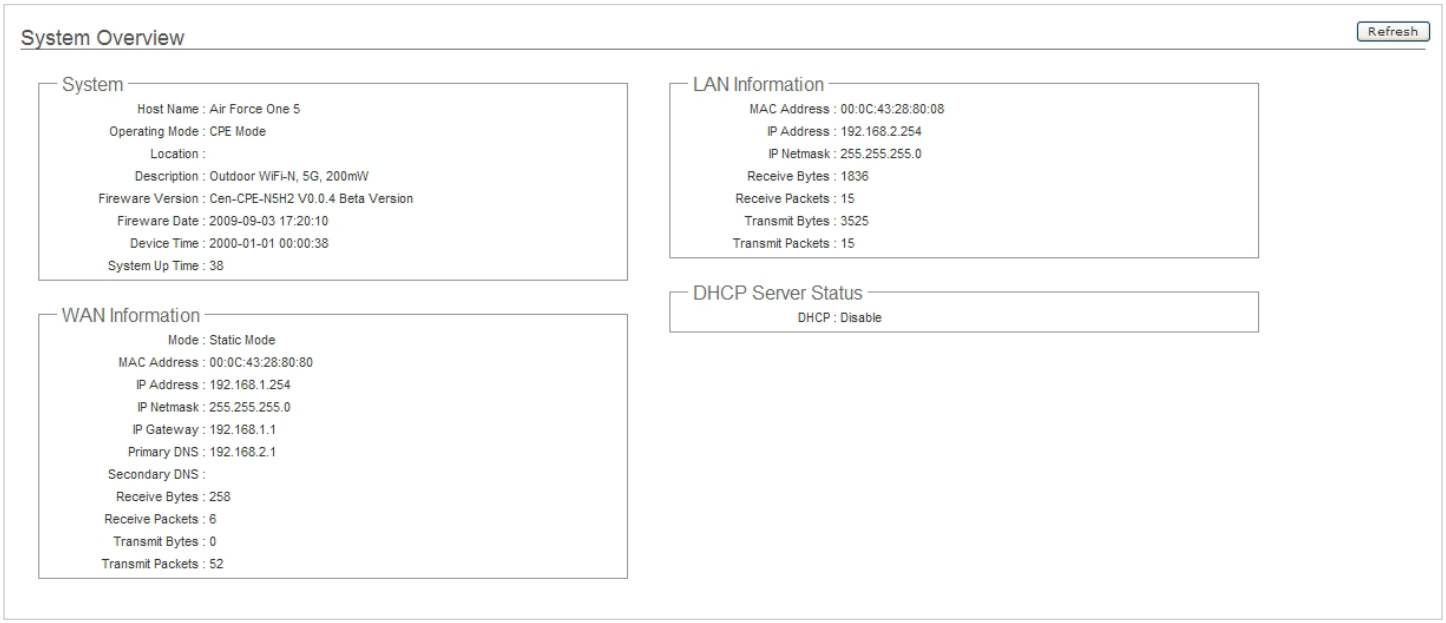
DMZ Enabled : 192.168.2.12

5.6 Observer Status

Information of current system settings can be over viewed via this page; statuses of **Overview**, **Station Statistics**, **Extra Info** and **Event Log** are displayed in this interface.

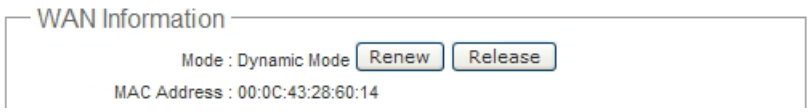
5.6.1 Overview

Detailed information on **System**, **WAN Information**, **LAN Information** and **DHCP Server Status** can be reviewed via this page.

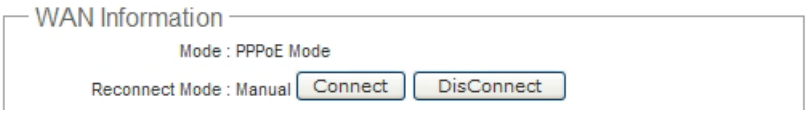


- **System :** Display the information of the system.
  - ➔ **System Name :** The name of the system.
  - ➔ **Operating Mode :** The mode currently in service.
  - ➔ **Location :** The reminding note on the geographical location of the system.
  - ➔ **Description :** The reminding note of the system.
  - ➔ **Firmware Version :** The current firmware version installed.
  - ➔ **Firmware Date :** The build time of the firmware installed.
  - ➔ **Device Time :** The current time of the system.
  - ➔ **System Up Time :** The time period that the system has been in service since last boot-up.
- **WAN Information :** Display the information of the WAN interface.

The WAN port specified **Dynamic IP**, the Release and Renew button will be show-up, click **Release** button to release IP address of WAN port, **Renew** button to renew IP address through DHCP server.



The WAN port specified **PPPoE**, and the **Connect** and **DisConnect** button will be show up. Click "**Connect**" button to assigned IP address from PPPoE server, "**DisConnect**" button to release IP address of WAN port.

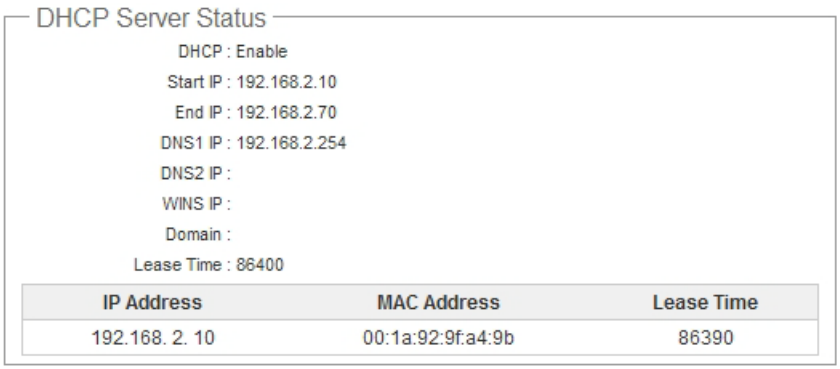


- ➔ **Mode :** The current mode of the WAN port.
- ➔ **Reconnect Mode :** The current reconnect mode of the PPPoE.
- ➔ **MAC Address :** The MAC address of the WAN port.
- ➔ **IP Address :** The IP address of the WAN port.
- ➔ **IP Netmask :** The IP netmask of the WAN port.
- ➔ **IP Gateway :** The gateway IP address of the WAN port.
- ➔ **Primary DNS :** The current primary DNS server of the system.
- ➔ **Secondary DNS :** The current secondary DNS server of the system.
- ➔ **Receive bytes :**The current receive bytes of the WAN port.
- ➔ **Receive packets :** The current receive packets of the WAN port.
- ➔ **Transmit bytes :** The current transmit bytes of the WAN port.
- ➔ **Transmit packets :** The current transmit packets of the WAN port.

- **LAN Information :** Display the detailed receive and transmit statistics of LAN interface.
  - ➔ **MAC Address :** The MAC address of the LAN port.

- ➔ **IP Address :** The IP address of the LAN port.
- ➔ **IP Netmask :** The IP netmask of the LAN port.
- ➔ **Receive bytes :**The current receive bytes of the LAN port.
- ➔ **Receive packets :** The current receive packets of the LAN port.
- ➔ **Transmit bytes :** The current transmit bytes of the LAN port.
- ➔ **Transmit packets :** The current transmit packets of the LAN port.

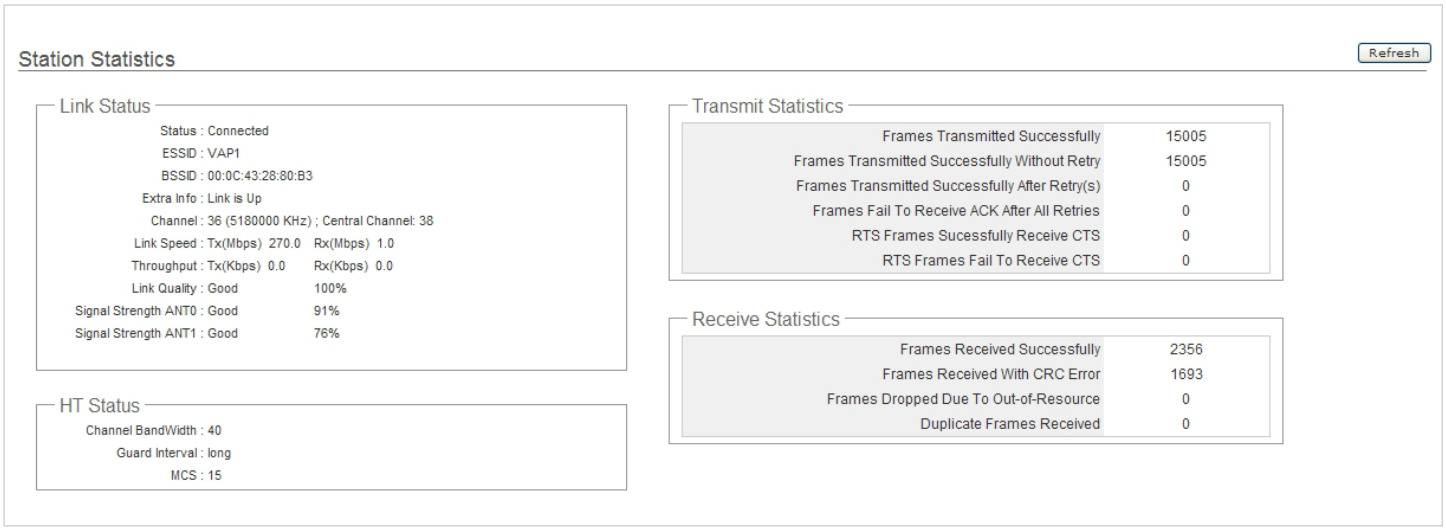
■ **DHCP Server Status :** The administrator can obtain DHCP client's IP/MAC address via this field. Below depicts an example for enabled DHCP server.



- ➔ **IP :** The IP address assigned by DHCP server to the specific LAN device.
- ➔ **MAC address :** The MAC address of the LAN device.
- ➔ **Lease Time :** Shows how long the leased IP address will be valid and reserved for particular DHCP client.

5.6.2 Station Statistics

The administrator can get Link information, Transmit and Receive Statistics via this page, Below depicts an example for Station Statistics.


Station Statistics
Refresh
Link Status
Status : Connected
ESSID : VAP1
BSSID : 00:0C:43:28:80:B3
Extra Info : Link is Up
Channel : 36 (5180000 KHz) ; Central Channel: 38
Link Speed : Tx(Mbps) 270.0 Rx(Mbps) 1.0
Throughput : Tx(Kbps) 0.0 Rx(Kbps) 0.0
Link Quality : Good 100%
Signal Strength ANT0 : Good 91%
Signal Strength ANT1 : Good 76%
HT Status
Channel BandWidth : 40
Guard Interval : long
MCS : 15
Transmit Statistics
Frames Transmitted Successfully 15005
Frames Transmitted Successfully Without Retry 15005
Frames Transmitted Successfully After Retry(s) 0
Frames Fail To Receive ACK After All Retries 0
RTS Frames Sucessfully Receive CTS 0
RTS Frames Fail To Receive CTS 0
Receive Statistics
Frames Received Successfully 2356
Frames Received With CRC Error 1693
Frames Dropped Due To Out-of-Resource 0
Duplicate Frames Received 0

- **Link Status :**
  - ➔ **Status :** Shows the current link status. It should be "**Connected**" or "**Disconnected**".
  - ➔ **ESSID :** Shows the current SSID, which must be the same on the wireless client and AP in order for communication to be established.
  - ➔ **BSSID :** Shows the associated BSSID, which can be used to identify the wireless access point.
  - ➔ **Extra Info :** Shows the current link status of extra information. It should be "**Link is Up**" or "**Link is Down**",
  - ➔ **Channel :** Shows current channel and central channel, its corresponding frequency.
  - ➔ **Link Speed(Mbps) :** The data transfer speed adopted by this network. (measured in Mbits per second)
  - ➔ **Throughput(Kbps) :** Shows the current transmit rate(Tx) and receive rate(Rx). (measured in Kbits per second)
  - ➔ **Link Quality :** Shows the link quality of the system with an access point.
  - ➔ **Signal Strength ANT0/ANT1 :** Shows the wireless signal strength of the connection between system and an access point.

- **HT Status :**

- ➔ **Channel BandWidth :** Shows the current channel bandwidth used for communication. It should be "**20**" or "**40**"
- ➔ **Guard Interval :** Shows the current GI used for communication. It should be "**short**" or "**long**".
- ➔ **MCS :** Shows the current GI used for communication. It should be between **0** to **15** or **32**.

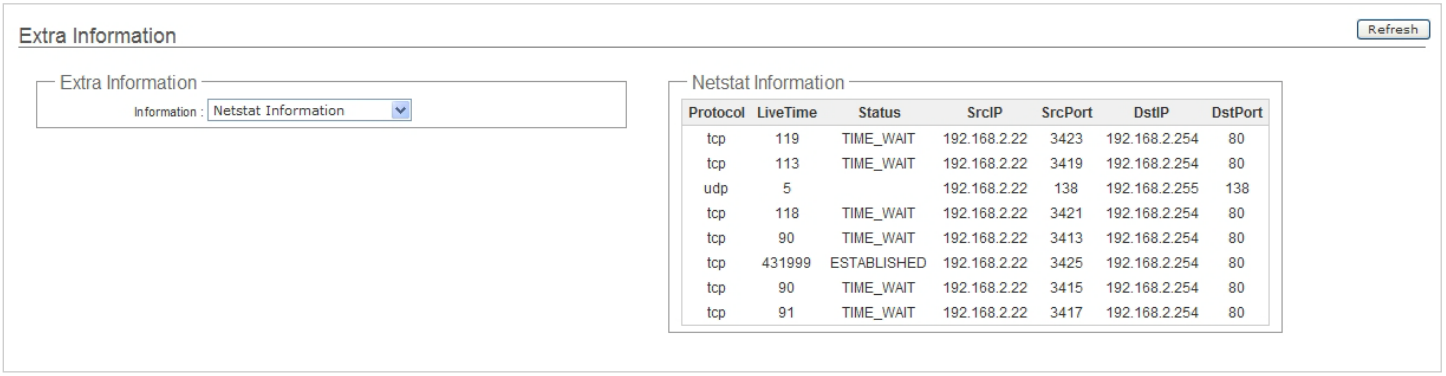
■ **Transmit Statistics**

- ➔ **Frames Transmitted Successfully:** The number of successfully transmitted frames.
- ➔ **Frames Transmitted Successfully Without Retry:** The number of successfully transmitted frames without any retry.
- ➔ **Frames Transmitted Successfully After Retry(s):** The number of successfully transmitted frames with one or more retries.
- ➔ **Frames Fail To Receive ACK After All Retries:** The number of unsuccessfully transmitted frame with many retries.
- ➔ **RTS Frames Successfully Receive CTS:** The number of successful received CTS (Clear To Send) response after this "Air Force One 5" sends out the RTS (Request To Send) message.
- ➔ **RTS Frames Fail To Receive CTS:** The number of unsuccessful received CTS response after this "Air Force One 5" sends out the RTS message.

■ **Receive Statistics**

- ➔ **Frames Received Successfully:** The number of successful received frames.
- ➔ **Frames Received With CRC Error:** The number of received frames with CRC (Cyclical Redundancy Checking) error.
- ➔ **Frames Dropped Due To Out-of-Resource:** The number of dropped frames.
- ➔ **Duplicate Frames Received:** The number of duplicate frames.

5.6.3 Extra Info



Protocol	LiveTime	Status	SrcIP	SrcPort	DstIP	DstPort
tcp	119	TIME_WAIT	192.168.2.22	3423	192.168.2.254	80
tcp	113	TIME_WAIT	192.168.2.22	3419	192.168.2.254	80
udp	5		192.168.2.22	138	192.168.2.255	138
tcp	118	TIME_WAIT	192.168.2.22	3421	192.168.2.254	80
tcp	90	TIME_WAIT	192.168.2.22	3413	192.168.2.254	80
tcp	431999	ESTABLISHED	192.168.2.22	3425	192.168.2.254	80
tcp	90	TIME_WAIT	192.168.2.22	3415	192.168.2.254	80
tcp	91	TIME_WAIT	192.168.2.22	3417	192.168.2.254	80

The administrator can get current device usage statistics and status of the system components from drop-down list.

- **Show Netstat Information :** Select "**NetStatus Information**" on the drop-down list, the connection track list should show-up, the list can be updated using the Refresh button.

  NetStatus will show all connection track on the system, the information include *Protocol*, *Live Time*, *Status* , *Source/Destination IP address* and *Port*.

- **Show Route Information :** Select "**Route Information**" on the drop-down list, the route table should show-up, the list can be updated using the Refresh button.

  "Air Force One 5" examines the destination IP address of each data packet traveling through the system and chooses the appropriate interface to forward the packet to. The system choice depends on static routing rules – entries, which are registered in system routing table. Static routes to specific hosts, networks or default gateway are set up automatically according to the IP configuration of all the system's interfaces.

Route Information

Destination	Gateway	Genmask	Flags	Metric	Ref	Use	Iface
192.168.2.0	0.0.0.0	255.255.255.0	U	0	0	0	bre0
192.168.1.0	0.0.0.0	255.255.255.0	U	0	0	0	ra0
127.0.0.0	0.0.0.0	255.255.255.0	U	0	0	0	lo
0.0.0.0	192.168.1.1	0.0.0.0	UG	0	0	0	ra0

- **Show ARP Information :** Select "**ARP Table Information**" on the drop-down list, the ARP table should show-up, the list can be updated using the Refresh button.

ARP is used to associate each IP address to the unique hardware address (MAC) the devices. It is important to have unique IP addresses for each MAC or else there will be ambiguous routes in the network.

ARP Table Information

IP Address	HW Type	Flags	HW Address	Mask	Device
192.168.2.22	0x1	0x2	00:1A:92:9F:A4:9B	*	bre0

- **Show Bridge Table Information :** Select “Bridge Table Information ” on the drop-down list, the bridge table should show-up, the list can be updated using the Refresh button.

  Bridge table will show Bridge ID and STP's Status on the each Ethernet bridge and its attached interfaces, the Bridge Port should be attached to some interfaces.

Bridge Table Information

Bridge Port	Bridge ID	STP Enabled	Interface
bre0	8000.000c43288008	no	eth2

- **Show MAC Information :** Select “**Bridge MACs Information**” on the drop-down list, all the list of MAC address should show up on the bridge table, the list can be updated using the Refresh button.

  Bridge MACs shows to which Bridge Port the particular station is associated to - in other words from which Interface (Ethernet or wireless) the network device (defined by MAC address) is reachable to the system while forwarding the packets to that port only (thus saving a lot of redundant copies and transmits).

  Ageing timer shows ageing time for each address entry (in seconds) - after particular time out, not having seen a packet coming from a certain address, the bridge will delete that address from the Bridge Table.

Bridge MACs Information

Port No	MAC Address	Local	Ageing Timer
1	00:0c:43:28:80:08	yes	0.00
1	00:1a:92:9f:a4:9b	no	0.04

- **Show STP Information :** Select “**Bridge STP Information**” on the drop-down list, all the list of STP information should show up on the STP table.

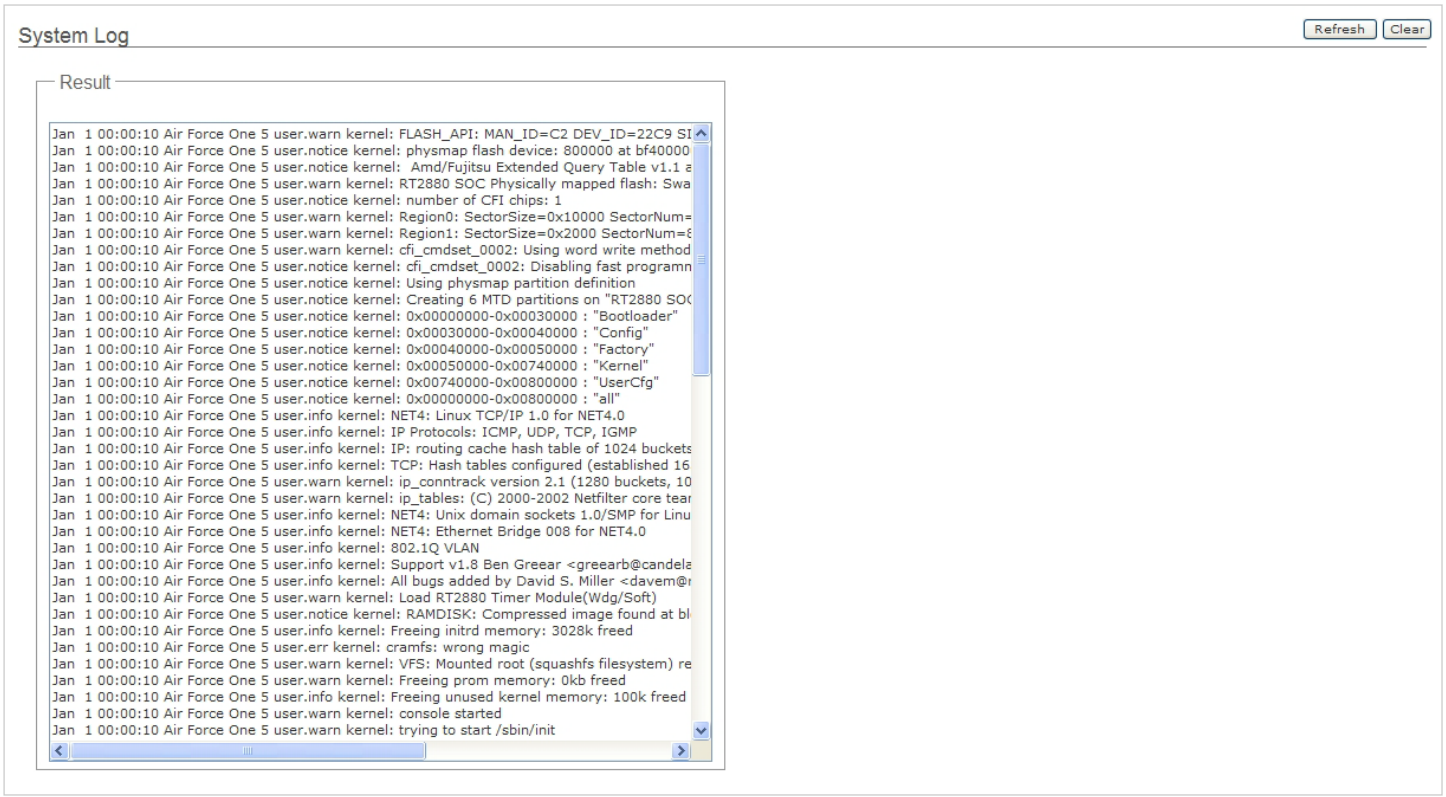
Bridge STP Information

bre0			
bridge id	8000.000c43288008		
designated root	8000.000c43288008		
root port	0	path cost	0
max age	20.00	bridge max age	20.00
hello time	2.00	bridge hello time	2.00
forward delay	15.00	bridge forward delay	15.00
ageing time	300.00		
hello timer	1.93	tcn timer	0.00
topology change timer	0.00	gc timer	3.92
flags			

eth2 (1)			
port id	8001	state	forwarding
designated root	8000.000c43288008	path cost	100
designated bridge	8000.000c43288008	message age timer	0.00
designated port	8001	forward delay timer	0.00
designated cost	0	hold timer	0.00
flags			

5.6.4 Event Log

The reported system events can be reviewed here.


System Log
Refresh
Clear
Result
Jan 1 00:00:10 Air Force One 5 user.warn kernel: FLASH_API: MAN_ID=C2 DEV_ID=22C9 SI
Jan 1 00:00:10 Air Force One 5 user.notice kernel: physmap flash device: 800000 at bf40000
Jan 1 00:00:10 Air Force One 5 user.notice kernel: Amd/Fujitsu Extended Query Table v1.1 a
Jan 1 00:00:10 Air Force One 5 user.warn kernel: RT2880 SOC Physically mapped flash: Swa
Jan 1 00:00:10 Air Force One 5 user.notice kernel: number of CFI chips: 1
Jan 1 00:00:10 Air Force One 5 user.warn kernel: Region0: SectorSize=0x10000 SectorNum=
Jan 1 00:00:10 Air Force One 5 user.warn kernel: Region1: SectorSize=0x2000 SectorNum=8
Jan 1 00:00:10 Air Force One 5 user.warn kernel: cfi_cmdset_0002: Using word write method
Jan 1 00:00:10 Air Force One 5 user.notice kernel: cfi_cmdset_0002: Disabling fast programn
Jan 1 00:00:10 Air Force One 5 user.notice kernel: Using physmap partition definition
Jan 1 00:00:10 Air Force One 5 user.notice kernel: Creating 6 MTD partitions on "RT2880 SO
Jan 1 00:00:10 Air Force One 5 user.notice kernel: 0x00000000-0x00030000 : "Bootloader"
Jan 1 00:00:10 Air Force One 5 user.notice kernel: 0x00030000-0x00040000 : "Config"
Jan 1 00:00:10 Air Force One 5 user.notice kernel: 0x00040000-0x00050000 : "Factory"
Jan 1 00:00:10 Air Force One 5 user.notice kernel: 0x00050000-0x00740000 : "Kernel"
Jan 1 00:00:10 Air Force One 5 user.notice kernel: 0x00740000-0x00800000 : "UserCfg"
Jan 1 00:00:10 Air Force One 5 user.notice kernel: 0x00000000-0x00800000 : "all"
Jan 1 00:00:10 Air Force One 5 user.info kernel: NET4: Linux TCP/IP 1.0 for NET4.0
Jan 1 00:00:10 Air Force One 5 user.info kernel: IP Protocols: ICMP, UDP, TCP, IGMP
Jan 1 00:00:10 Air Force One 5 user.info kernel: IP: routing cache hash table of 1024 buckets
Jan 1 00:00:10 Air Force One 5 user.info kernel: TCP: Hash tables configured (established 16
Jan 1 00:00:10 Air Force One 5 user.warn kernel: ip_conntrack version 2.1 (1280 buckets, 10
Jan 1 00:00:10 Air Force One 5 user.warn kernel: ip_tables: (C) 2000-2002 Netfilter core tear
Jan 1 00:00:10 Air Force One 5 user.info kernel: NET4: Unix domain sockets 1.0/SMP for Linu
Jan 1 00:00:10 Air Force One 5 user.info kernel: NET4: Ethernet Bridge 008 for NET4.0
Jan 1 00:00:10 Air Force One 5 user.info kernel: 802.1Q VLAN
Jan 1 00:00:10 Air Force One 5 user.info kernel: Support v1.8 Ben Greear <greearb@candela
Jan 1 00:00:10 Air Force One 5 user.info kernel: All bugs added by David S. Miller <davem@r
Jan 1 00:00:10 Air Force One 5 user.warn kernel: Load RT2880 Timer Module(Wdg/Soft)
Jan 1 00:00:10 Air Force One 5 user.notice kernel: RAMDISK: Compressed image found at bl
Jan 1 00:00:10 Air Force One 5 user.info kernel: Freeing initrd memory: 3028k freed
Jan 1 00:00:10 Air Force One 5 user.err kernel: cramfs: wrong magic
Jan 1 00:00:10 Air Force One 5 user.warn kernel: VFS: Mounted root (squashfs filesystem) re
Jan 1 00:00:10 Air Force One 5 user.warn kernel: Freeing prom memory: 0kb freed
Jan 1 00:00:10 Air Force One 5 user.info kernel: Freeing unused kernel memory: 100k freed
Jan 1 00:00:10 Air Force One 5 user.warn kernel: console started
Jan 1 00:00:10 Air Force One 5 user.warn kernel: trying to start /sbin/init

- **Date/ Time:** The date and time when the event occurred.
- **Hostname:** The name of the host which records the event. It helps the administrator identify the source of the reported events.
- **Process name (with square brackets):** Indicate the process with which the specific event is associated.
- **Description:** Description of the event.

Click ***Refresh*** button to renew the log, or click ***Clear*** button to clear all the record.

Chapter 6. Universal Repeater Mode Configuration

When Universal Repeater mode is activated, the system can be configured as an **Access Point** and **Client Station** simultaneously. This section provides information in configuring the Universal Repeater mode with graphical illustrations. "Air Force One 5" provides functions as stated below where they can be configured via a user-friendly web based interface.

Option	System	Wireless	Utilities	Status
Functions	Operating Mode	General Settings	Profiles Settings	System Overview
	LAN	Advanced Settings	Firmware Upgrade	Clients
	Management	Virtual AP	Network Utility	Remote AP
	Time Server	Wireless Profile	Reboot	Extra Info
	UPNP	Site Survey		Event Log
	SNMP			

Table 6-1: Universal Repeater Mode Functions

6.1 External Network Connection

6.1.1 Network Requirement

It can be used as an Outdoor Universal Repeater to receive wireless signal over last mile applications, and **accepts** wireless connections from client devices. The wired clients of “Air Force One 5” are in the same subnet from Main Base Station.

The first step, you need to have one access point (Base Station) and it connect to Internet. Then, Connecting your PC/NB to the LAN port of “Air Force One 5”, **Figure 6-1** shows Universal Repeater mode configuration

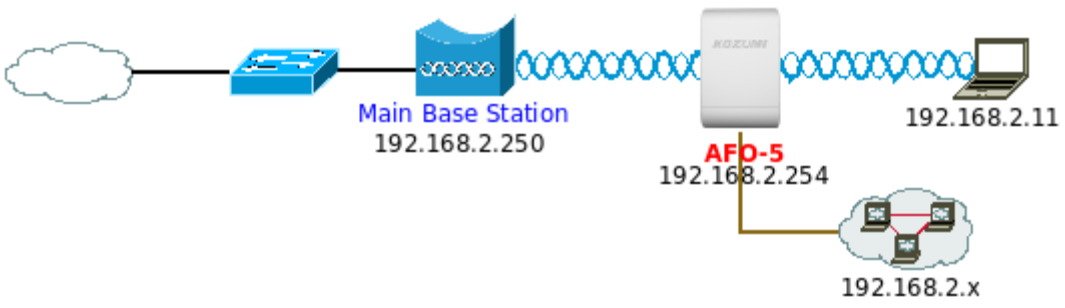


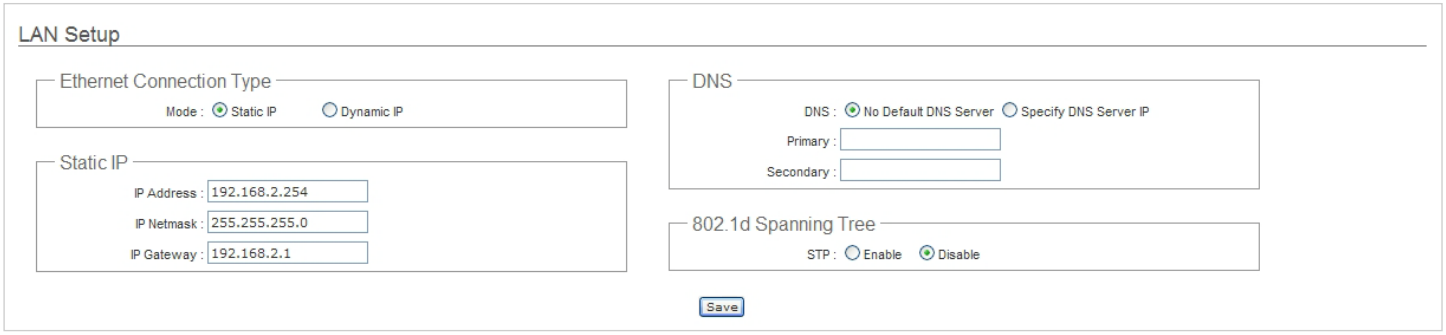
Figure 6-1 Universal Repeater mode Configuration

When the AFO-5 configured as an Access Point and Client Station simultaneously, the Wireless General and Advanced Setup also used simultaneously. But the Security Type can different. In the other word, the channel or other settings will be the same between AFO-5 to Main Base Station and wireless client to AFO-5, but security type can be different.

6.1.2 Configuration LAN IP

Here are the instructions for how to setup the local IP Address and Netmask.

Please click on **System -> LAN** and follow the below setting.



- **Mode :** Check either “Static IP” or “Dynamic IP” button as desired to set up the system IP of LAN port .
  - ➔ **Static IP :** The administrator can manually setup the LAN IP address when static IP is available/ preferred.
  - ➔ **IP Address :** The IP address of the LAN port; default IP address is 192.168.2.254
  - ➔ **IP Netmask :** The Subnet mask of the LAN port; default Netmask is 255.255.255.0
  - ➔ **IP Gateway :** The default gateway of the LAN port; default Gateway is 192.168.2.1
  - ➔ **Dynamic IP :** This configuration type is applicable when the "Air Force One 5" is connected to a network with the presence of a DHCP server; all related IP information will be provided by the DHCP server automatically.

  - ➔ **Hostname :** The Hostname of the LAN port

- **DNS :** Check either “No Default DNS Server” or “Specify DNS Server IP” button as desired to set up the system DNS.
  - ➔ **Primary :** The IP address of the primary DNS server.
  - ➔ **Secondary :** The IP address of the secondary DNS server.

- **802.1d Spanning Tree**

  The spanning tree network protocol provides a loop free topology for any bridged LAN. The Spanning Tree Protocol, which is also referred to as STP, is defined in the IEEE Standard 802.1d.

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes

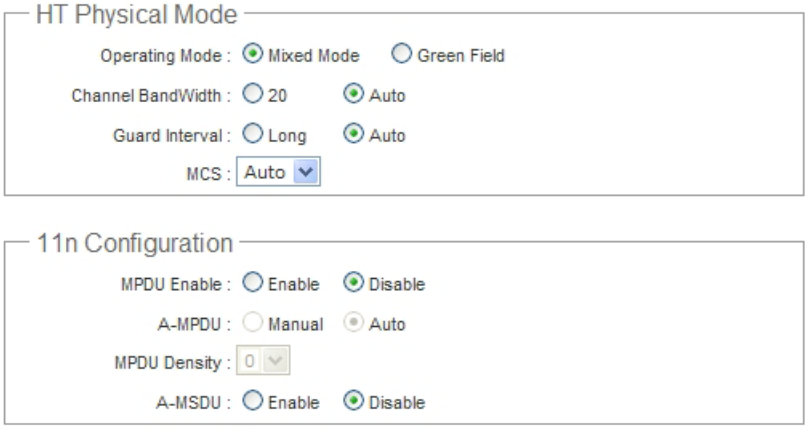
6.2 Access Point Association

6.2.1 Configure Wireless General Setting

The administrator can change the data transmission, channel and output power settings for the system. Please click on **Wireless -> General Setup** and follow the below setting.

- **Band Mode :** Select an appropriate wireless band; bands available are ***801.11a***or ***802.11a/n mixed mode***.
- **Country :** Select the desired country code from the drop-down list; the options are ***US***, ***ETSI***, ***JP*** and ***NONE***.
- **Transmit Rate Control :** Select the desired rate from the drop-down list; the options are auto or ranging from 1 to 54Mbps for **802.11a**
- **Tx Power :** You can adjust the output power of the system to get the appropriate coverage for your wireless network. Specify digit number between ***1*** to ***100*** (the unit is %) for your environment. If you are not sure of which setting to choose, then keep the default setting, 100%.

When **Band Mode** select in **802.11a/n mixed mode**, the **HT(High Throughput) Physical Mode and 11n Configuration** settings should be shown-up immediately.


HT Physical Mode
Operating Mode : Mixed Mode Green Field
Channel BandWidth : 20 Auto
Guard Interval : Long Auto
MCS : Auto
11n Configuration
MPDU Enable : Enable Disable
A-MPDU : Manual Auto
MPDU Density : 0
A-MSDU : Enable Disable

- **Operating Mode :**
  - ➔ **Mixed Mode :** In this mode packets are transmitted with a preamble compatible with the legacy 802.11a/g, the rest of the packet has a new format. In this mode the receiver shall be able to decode both the Mixed Mode packets and legacy packets.
  - ➔ **Green Field :** In this mode high throughput packets are transmitted without a legacy compatible part.
- **Channel Bandwidth :** The "**Auto**" MHz option is usually best. The other option is available for special circumstances.
- **Guard Interval :** Using "**Auto**" option can increase throughput. However, it can also increase error rate in some installations, due to increased sensitivity to radio-frequency reflections. Select the option that works best for your installation.
- **MCS :** This parameter represents transmission rate. By default (Auto) the fastest possible transmission rate will be selected. You have the option of selecting the speed if necessary.
- MPDU Enable : Check ***Enable*** button to activate this function, and ***Disable*** to deactivate.
- **A-MPDU** : A-MPDU (Aggregated Mac Protocol Data Unit) allows the transmissions of multiple Ethernet frames to a single location as burst of up to 64kbytes This is performed on the hardware itself. Select "Manual" to set "MPDU Density"
- **MPDU Density :** Minimum separation of MPDUs in an A-MPDU.

0	1	2	3	4	5	6	7
No Restriction	¼ µs	½ µs	1 µs	2 µs	4 µs	8 µs	16 µs

- **A-MSDU : Aggregated** Mac Service Data Unit, A-MSDU. Select **Enable** to allow aggregation for multiple MSDUs in one MPDU. Default is disabled.

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes.

6.2.2 Wireless Advanced Setup

The administrator can change the RTS threshold and fragmentation threshold settings for the system. Please click on

Wireless Setup
Advanced Setup
Beacon Interval : 100 ms
Data Beacon Rate(DTIM) : 1 ms
Fragment Threshold : 2346
RTS Threshold : 2347
Short Preamble : Enable Disable
Short Slot : Enable Disable
Tx Burst : Enable Disable
Pkt_Aggregate : Enable Disable
IEEE 802.11H : Enable Disable
WMM Capable : Enable Disable
Save

Wireless -> Advanced Setup and follow the below setting.

- **Beacon Interval :** Enter a value between **20** and **1024** msec. The default value is **100** milliseconds. The entered time means how often the beacon signal transmission between the access point and the wireless network.
- **DTIM Interval :** A DTIM is a countdown informing clients of the next window for listening to broadcast and multicast messages. When the wireless router has buffered broadcast or multicast messages for associated clients, it sends the next DTIM with a DTIM Interval value. Wireless clients detect the beacons and awaken to receive the broadcast and multicast messages. The default value is 1. Valid settings are between **1** and **255**.
- **Fragment Threshold :** The value specifies the maximum size of packet allowed before data is fragmented into multiple packets. Please use this value to tune the wireless connection if lots of retransmission happens. Enter a value ranging from **256** to **2346**.
- **RTS Threshold :** Tuning the Request to Send, RTS threshold will help the system control its access to medium and alleviate the hidden node problem. Enter a value ranging from **1** to **2347**.
- **Short Preamble :** The short preamble provides 56-bit Synchronization field to improve WLAN transmission efficiency. Check ***Enable*** button for using Short Preamble, and ***Disable*** for using the Long Preamble, 128-bit Synchronization field, option.
- **Short Slot :** Enable or disable short slot. Default is enabled.
- **Tx Burst :** Click ***Enable*** button to activate Tx Burst, and ***Disable*** to deactivate Tx Burst. Enable the Tx Burst can

increase transmission throughput.

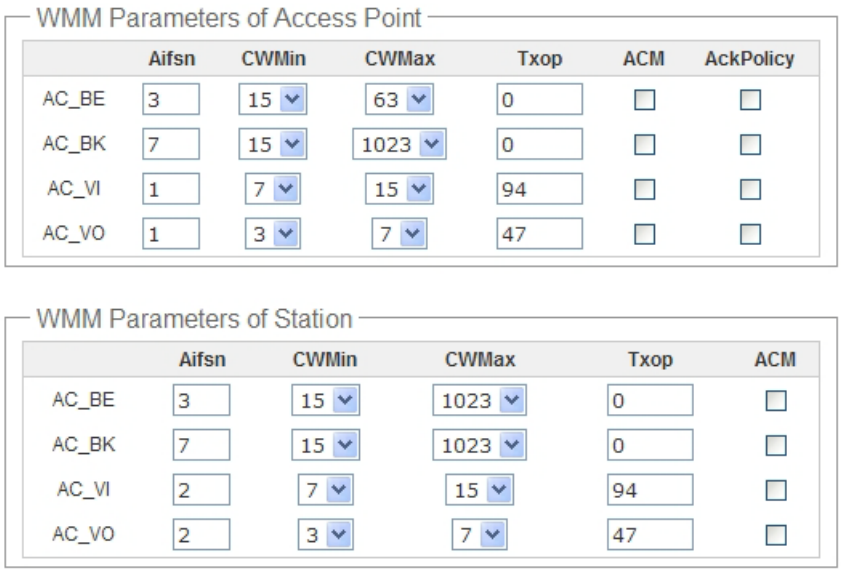
- **Pkt_Aggregate :** Increase efficiency by aggregating multiple packets of application data into a single transmission frame. In this way, 802.11n networks can send multiple data packets with the fixed overhead cost of just a single frame.

- **IEEE802.11H :** Select Enable to enable DFS(Dynamic Frequency Selection). Default is Enable. When a DFS-enabled radio is operating on one of the following channels, the wireless device uses DFS to monitor the operating frequency and switch to another frequency or reduce power as necessary:

DFS Channels	52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 136, 140

The maximum legal transmit power is greater for some 5 GHz channels than for others. When the wireless device randomly selects a 5 GHz channel on which power is restricted, the wireless device automatically reduces transmit power to comply with power limits for that channel in that regulatory domain.

- **WMM Capable :** Select Enable, the configuration field of WMM parameters should appear.


WMM Parameters of Access Point
Aifsn CWMin CWMax Txop ACM AckPolicy
AC_BE 3 15 63 0
AC_BK 7 15 1023 0
AC_VI 1 7 15 94
AC_VO 1 3 7 47
WMM Parameters of Station
Aifsn CWMin CWMax Txop ACM
AC_BE 3 15 1023 0
AC_BK 7 15 1023 0
AC_VI 2 7 15 94
AC_VO 2 3 7 47

When you enable WMM Capable, the "Tx Burst" will be Disabled automatically by system.

WMM Parameters of Access Point : *This affects traffic flowing from the access point to the client station*

Queue	Data Transmitted AP to Clients	Priority	Description
AC_BK	Background.	Low	High throughput. Bulk data that requires maximum throughput and is not time-sensitive is sent to this queue (FTP data, for example).
AC_BE	Best Effort	Medium	Medium throughput and delay. Most traditional IP data is sent to this queue
AC_VI	Video	High	Minimum delay. Time-sensitive video data is automatically sent to this queue
AC_VO	Voice	High	Time-sensitive data like VoIP and streaming media are automatically sent to this queue

Configuring QoS options consists of setting parameters on existing queues for different types of wireless traffic. You can configure different minimum and maximum wait times for the transmission of packets in each queue based on the requirements of the media being sent. Queues automatically provide minimum transmission delay for Voice, Video, multimedia, and mission critical applications, and rely on best-effort parameters for traditional IP data.

As an Example, time-sensitive Voice & Video, and multimedia are given effectively higher priority for transmission (lower wait times for channel access), while other applications and traditional IP data which are less time-sensitive but often more data-intensive are expected to tolerate longer wait times.

- ✓ **Aifsn** : The Arbitration Inter-Frame Spacing Number specifies a wait time (in milliseconds) for data frames
- ✓ **CWmin** : Minimum Contention Window. This parameter is input to the algorithm that determines the initial random backoff wait time ("window") for retry of a transmission. The value specified here in the Minimum Contention Window is the upper limit (in milliseconds) of a range from which the initial random backoff wait time is determined.
- ✓ **CWmax** : Maximum Contention Window. The value specified here in the Maximum Contention Window is the upper limit (in milliseconds) for the doubling of the random backoff value. This doubling continues until either the data frame is sent or the Maximum Contention Window size is reached. Once the Maximum Contention Window size is reached, retries will continue until a maximum number of retries allowed is reached. Valid values for the "cwmax" are 1, 3, 7, 15, 31, 63, 127, 255, 511, or 1024. The value for "cwmax" must be higher than the value for "cwmin".

- ✓ **Txop** : Transmission Opportunity is an interval of time when a WME AP has the right to initiate transmissions onto the wireless medium (WM). This value specifies (in milliseconds) the Transmission Opportunity (TXOP) for AP; that is, the interval of time when the WMM AP has the right to initiate transmissions on the wireless network.
- ✓ **ACM :** Admission Control Mandatory, ACM only takes effect on AC_VI and AC_VO. When you do not click Checkbox, it means that the ACM is controlled by the connecting AP. If you click Checkbox, it means that the Client is in charge.
- ✓ **AckPolicy :** Acknowledgment Policy, WMM defines two ACK policies: **Normal ACK** and **No ACK**. Click "**Checkbox**" indicates "**No ACK**"

  When the no acknowledgement (No ACK) policy is used, the recipient does not acknowledge received packets during wireless packet exchange. This policy is suitable in the environment where communication quality is fine and interference is weak. While the No ACK policy helps improve transmission efficiency, it can cause increased packet loss when communication quality deteriorates. This is because when this policy is used, a sender does not retransmit packets that have not been received by the recipient.

  When the Normal ACK policy is used, the recipient acknowledges each received unicast packet.

➔ ***WMM Parameters of Station :*** *This affects traffic flowing from the client station to the access point.*

Queue	Data Transmitted Clients to AP	Priority	Description
AC_BK	Background.	Low	High throughput. Bulk data that requires maximum throughput and is not time-sensitive is sent to this queue (FTP data, for example).
AC_BE	Best Effort	Medium	Medium throughput and delay. Most traditional IP data is sent to this queue
AC_VI	Video	High	Minimum delay. Time-sensitive video data is automatically sent to this queue
AC_VO	Voice	High	Time-sensitive data like VoIP and streaming media are automatically sent to this queue

- ✓ **Aifsn** : The Arbitration Inter-Frame Spacing Number specifies a wait time (in milliseconds) for data frames
- ✓ **CWmin** : Minimum Contention Window. This parameter is input to the algorithm that determines the initial random backoff wait time ("window") for retry of a transmission. The value specified here in the Minimum Contention Window is the upper limit (in milliseconds) of a range from which the initial random backoff wait time is determined.

- ✓ **CWmax** : Maximum Contention Window. The value specified here in the Maximum Contention Window is the upper limit (in milliseconds) for the doubling of the random backoff value. This doubling continues until either the data frame is sent or the Maximum Contention Window size is reached. Once the Maximum Contention Window size is reached, retries will continue until a maximum number of retries allowed is reached. Valid values for the "cwmax" are 1, 3, 7, 15, 31, 63, 127, 255, 511, or 1024. The value for "cwmax" must be higher than the value for "cwmin".
- ✓ **Txop** : Transmission Opportunity is an interval of time when a WME AP has the right to initiate transmissions onto the wireless medium (WM). This value specifies (in milliseconds) the Transmission Opportunity (Txop) for AP; that is, the interval of time when the WMM AP has the right to initiate transmissions on the wireless network.
- ✓ **ACM :** Admission Control Mandatory, ACM only takes effect on AC_VI and AC_VO. When you do not click Checkbox, it means that the ACM is controlled by the connecting AP. If you click Checkbox, it means that the Client is in charge.

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes. The items in this page are for AP's RF advanced settings and will be applied to all VAPs.

6.2.3 Wireless Environment Scanning

Access points located around the system can be found via the scan function. The administrator can then select a desired AP to be associated with via this page.

Please click on **Wireless -> Site Survey**. Below depict an example for site survey.

Station Site Survey

SSID	BSSID	Signal	Channel	Security	Band	Network Type	Select
Main_AP	00:0c:43:28:80:b2	99%	36	NONE	11a/n	Infrastructure	Select
VAP1	00:0c:43:28:80:b3	99%	36	WEP	11a/n	Infrastructure	Select
VAP2	00:0c:43:28:80:b4	99%	36	WPAPSK/AES	11a/n	Infrastructure	Select
VAP3	00:0c:43:28:80:b5	99%	36	WPA2PSK/TKIP	11a/n	Infrastructure	Select
VAP4	00:0c:43:28:80:b6	99%	36	WPA/AES	11a/n	Infrastructure	Select

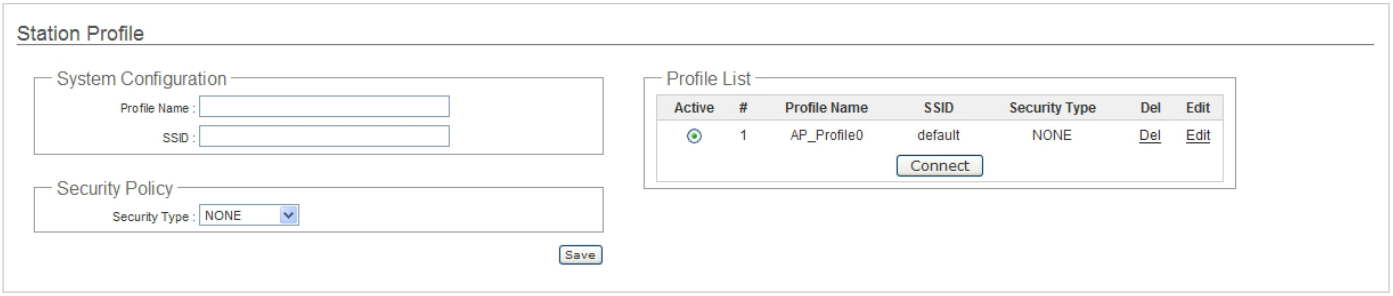
- **SSID :** Service Set ID of the AP or repeater found around the system.
- **BSSID :** MAC address of the respective AP.
- **Signal :** Indicate the signal strength of the respective AP.
- **Channel :** The channel number currently used by the respective AP.
- **Security :** Security type enabled by the respective AP.
- **Network Type :** Network type enabled by the respective AP.
- **Select:** Click “Select” to configure settings for associating with the respective AP.

*When you click “Select” on Station Site Survey Table, the system will copy “**ESSID**” and “**Security Type**” to Wireless Profile page. But, you also need setting some parameters (e.g. Profile Name or Security Key) on Wireless Profile page. About Wireless Profile setting, please see next section.*

6.2.4 Create Wireless Profile

The administrator can configure station profiles via this page.

Please click on **Wireless -> Wireless Profile** and follow the below setting.



- **Profile Name :** Create a profile name for the current wireless network connection. For different wireless network, set different profiles for quick connection uses.

- **SSID :** Service Set Identifier, which is unique name shared among all clients in a wireless network. It must be identical with your wireless router or access point's SSID settings.

- **Security Type :** Configure an appropriate security type for association, the Security Type can be select in "**NONE**", "**OPEN**", "**SHARED**", "**WPA-PSK**", or "**WPA2-PSK**" from drop-down list; the type needs to be the same as that associated access point.

  OPEN / SHARED : OPEN and SHARED require the user to set a WEP key to exchange data.

  ➔ **Key Index :** Select key index used to designate the WEP key during data transmission. 4 different WEP keys

can be configured at the same time, but only one is used. Effective key is set with a choice of WEP Key 1, 2, 3, or 4.

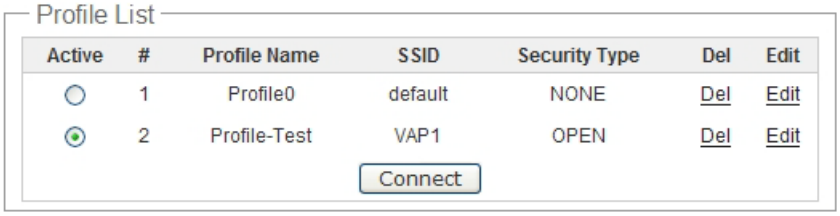
➔ **WEP Key # :** Enter **HEX(10 or 26)** or **ASCII(5 or 13)** format WEP key value; the system support up to 4 sets of WEP keys.

- **WPA-PSK (or WPA2-PSK) :** WPA (or WPA2) Algorithms, allows the system accessing the network by using the WPA-PSK protected access.

➔ **Cipher Suite :** Select the desired cipher suite from the drop-down list; the options are **AES** and **TKIP**

➔ **Pre-shared Key :** Enter the information for pre-shared key; the key can be either entered as a 256-bit secret in **64 HEX** digits format, or **8 to 63 ASCII** characters.

- **Profile List :** The user can manage the created profiles for home, work or public areas. Below depict an example for Profile List



➔ Click “”**Edit**” an exist profile on the Profile List. The field of System Configuration and Security Policy will display profile's content. Edit profile's content and then click “**Save**” button to save the profile.

➔ Click “**Del**” to remove profile.

➔ Click and Select a profile from list, then click the "**Connect**" button to connecting to the wireless network with the profile setting.

If you only click "Connect" button and does not click "Save" button. The selected profile would not be saved on the Profile List

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes

6.3 Wireless LAN Network Creation

The system manager can configure related wireless settings, **Virtual AP Setting, Security Settings,** and **Access Control Settings**.

When Universal Repeater mode is activated, the system can be configured as an **Access Point** and **Client Station** simultaneously.

6.3.1 Create Virtual AP

The “Air Force One 5” support broadcasting multiple SSIDs, allowing the creation of Virtual Access Points, partitioning a single physical access point into **8** logical access points, each of which can have a different set of security, VLAN tag(ID) and network settings. **Figure 6-2** shows multiple SSIDs with different security type and vlan settings.

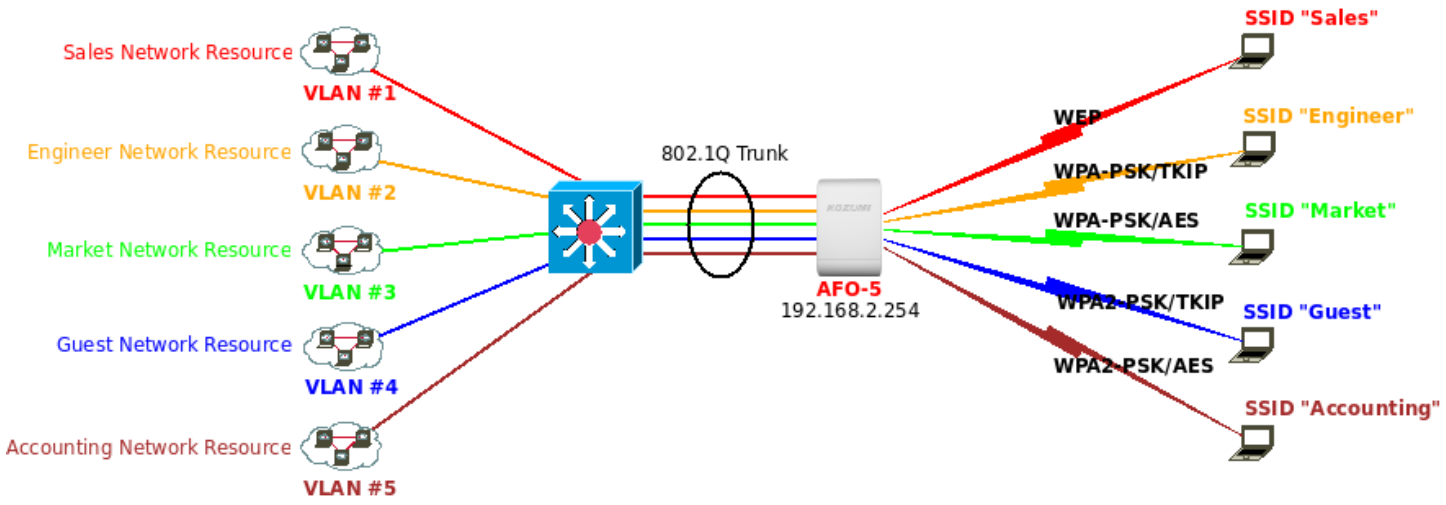


Figure 6-2 Multiple SSIDs with different Security Type and VLAN Tag

6.3.1.1 Virtual AP Overview

The administrator can view all of the Virtual AP's settings via this page.

Please click on **Wireless -> Virtual AP Setup** and the Virtual AP Overview Page appears.

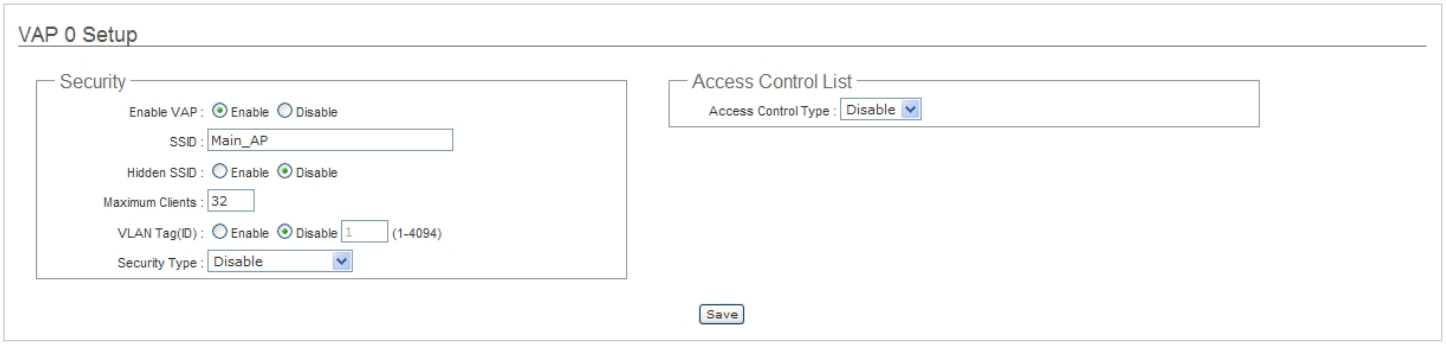
Virtual AP Overview
VAP List
VAP ESSID Status Security Type MAC ACL Edit
Primary AP Main_AP ON None Disable Edit
VAP1 OFF None Disable Edit
VAP2 OFF None Disable Edit
VAP3 OFF None Disable Edit
VAP4 OFF None Disable Edit
VAP5 OFF None Disable Edit
VAP6 OFF None Disable Edit
VAP7 OFF None Disable Edit

- **VAP :** Indicate the system's Virtual AP
- **ESSID :** Indicate the ESSID of the respective Virtual AP
- **Status :** Indicate the Status of the respective Virtual AP
- **Security Type :** Indicate the security type of the respective Virtual AP used.
- **MAC ACL :** Indicate the MAC ACL of the respective Virtual AP used.
- **Edit :** Click Edit button for configuring Virtual AP's settings, security type and ACL.

6.3.1.2 Virtual AP Setup

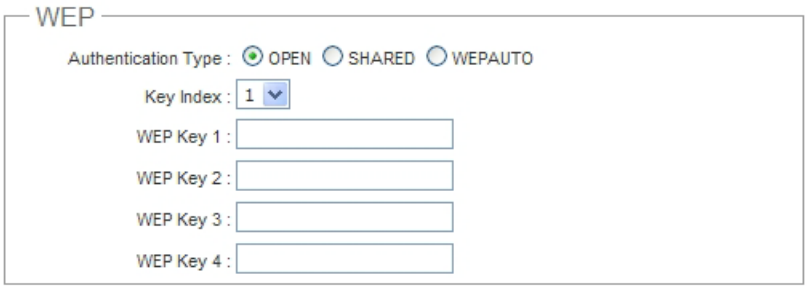
For each Virtual AP, administrators can configure SSID, VLAN tag (ID), SSID broadcasting, Maximum number of client associations, security type and Access Control List(ACL) settings.

Click **Edit** link on the VAP List, and then Virtual AP setup page appears.



- **Enable VAP :** Click “Enable” to activate VAP or click “Disable” to deactivate this function
- **SSID :** Service Set ID, ESSID will determine the service type of a client which is assigned to the specified VAP. When clients are browsing for available wireless networks, this is the SSID that will appear in the list.
- **Hidden SSID :** Select this option to enable the SSID to broadcast in your network. When configuring the network, it is suggested to enable this function but disable it when the configuration is complete. With this enabled, someone could easily obtain the SSID information with the site survey software and get unauthorized access to a private network. With this disabled, network security is enhanced and can prevent the SSID from being seen in the network.
- **Maximum Clients :** You can set the number of wireless clients that can associate via a particular SSID, Enter maximum number of clients to a desired number. For example, while the number of client is set to 5, only 5 clients are allowed to connect with this VAP. The default value is **32**
- **VLAN Tag(ID) :** Virtual LAN, the system supports tagged VLAN. To enable VLAN function; valid values are from **1** to **4094**. If your network uses VLANs, you can assign an SSID to VLAN1, and the access point groups client devices using that SSID into VLAN1. This enables the separation of wireless applications based on security.
- **Security Type :** Select the desired security type from the drop-down list; the options are **Disable**, **WEP**, **WPA-PSK**, **WPA2-PSK**, **WPA-Enterprise**, **WPA2-Enterprise** and **WEP 802.1X**.
  - ➔ **Disable :** Data are unencrypted during transmission when this option is selected.
  - ➔ **WEP :** WEP, Wired Equivalent Privacy, is a data encryption mechanism based on a 64-bit or 128-bit shared key.

Select ***WEP*** as the security type from the drop-down list as desired.

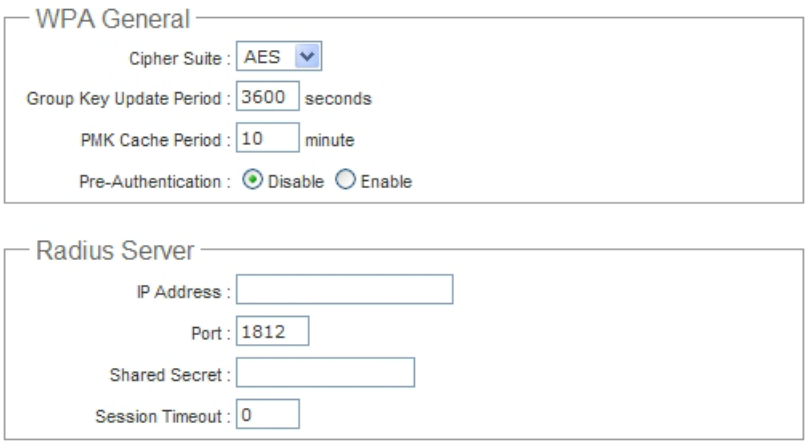


- ✓ **Authentication Method :** Enable the desire option among ***OPEN***, ***SHARED*** or ***WEPAUTO***.
- ✓ **Key Index :** Select key index used to designate the WEP key during data transmission. 4 different WEP keys can be configured at the same time, but only one is used. Effective key is set with a choice of WEP Key 1, 2, 3, or 4.
- ✓ **WEP Key # :** Enter **HEX(10 or 26)** or **ASCII(5 or 13)** format WEP key value; the system support up to 4 sets of WEP keys.

➔ **WPA-PSK (or WPA2-PSK) :** WPA (or WPA2) Algorithms, allows the system accessing the network by using the WPA-PSK protected access.

- ✓ **Cipher Suite :** Check on the respective button to enable either ***AES*** or ***TKIP*** cipher suites; default is **AES**.
- ✓ **Pre-shared Key :** Enter the information for pre-shared key; the key can be either entered as a 256-bit secret in **64 HEX** digits format, or **8 to 63 ASCII** characters.
- ✓ **Group Key Update Period :** This time interval for e-keying GTK (broadcast/multicast encryption keys) in seconds. Enter the time-length required; the default time is **3600** seconds.

➔ **WPA-Enterprise (or WPA2-Enterprise):** The RADIUS authentication and encryption will be both enabled if this is selected.



✓ **WPA General Settings :**

- **Cipher Suite :** Select the desired cipher suite from the drop-down list; the options are **AES** and **TKIP**
- **Group Key Update Period :** This time interval for re-keying GTK (broadcast/ multicast encryption keys) in seconds. Enter the time-length required; the default time is **3600** seconds.
- **PMK Cache Period :** Pairwise Master Key, PMK. Set **WPA2** PMKID cache timeout period, after time out, the cached key will be deleted.
- **Pre-Authentication :** Set WPA2 pre-authentication mode. This is used to speed up roaming before pre-authenticating IEEE 802.1X/EAP part of the full RSN authentication and key handshake before actually associating with a new AP. Default is disable.

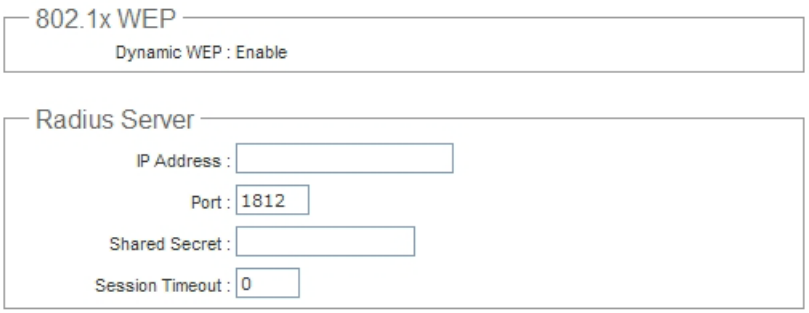
✓ **RADIUS Server Settings :**

- **IP Address :** Enter the IP address of the Authentication RADIUS server.
- **Port :** The port number used by Authentication RADIUS server. Use the default 1812 or enter port

number specified.

- **Shared secret :** The secret key for system to communicate with Authentication RADIUS server. Support **8 to 64 characters**.
- **Session Timeout :** Amount of time before a client will be required to re-authenticate. The Session Timeout unit is seconds and must be larger than **60** ; **0** is disable re-authenticate service.

➔ **WEP 802.1X :** When WEP 802.1x Authentication is enabled, please refer to the following settings to complete the configuration.



✓ **Radius Server Settings :**

- **IP Address :** Enter the IP address of the Authentication RADIUS server.
- **Port :** The port number used by Authentication RADIUS server. Use the default 1812 or enter port number specified.
- **Shared secret :** The secret key for system to communicate with Authentication RADIUS server. Support **8 to 64 characters**.
- **Session Timeout :** Amount of time before a client will be required to re-authenticate. The Session Timeout unit is seconds and must be larger than **60** ; **0** is disable re-authenticate service.

6.3.2 Black Wireless Clients

Continue **6.3.1.2 Virtual AP Setup** section. For each Virtual AP setting, the administrator can allow or reject clients to access each Virtual AP.

- **Access Control Type :** Select the desired access control type from the drop-down list; the options are **Disable**, **Allow** or **Reject**..

  There are two ways to set the Access Control List :

  ➔ **Access Control Type** is set to **Allow**.

  The wireless clients in the "**Enable**" list which will be **allowed** access to the Access Point; in the other word, the wireless clients in the "**Disable**" list will be **denied** access to the Access Point

  ➔ **Access Control Type** is set to **Reject**.

  The wireless clients in the "**Enable**" list which will **denied** access to the Access Point; in the other word, the wireless clients in the "**Disable**" list will be **granted** access to the Access Point.

- **Add a station MAC :** Enter MAC address in this field (e.g. aa:bb:cc:00:00:0a) and click "Add" button, then the MAC address should be display on "**Enable**" list

There are a maximum of **20** clients allowed in this MAC address list. The MAC addresses of the wireless clients can be added and removed to the list using the **Add** and **Remove** buttons.

Click ***Reboot*** button to activate your changes

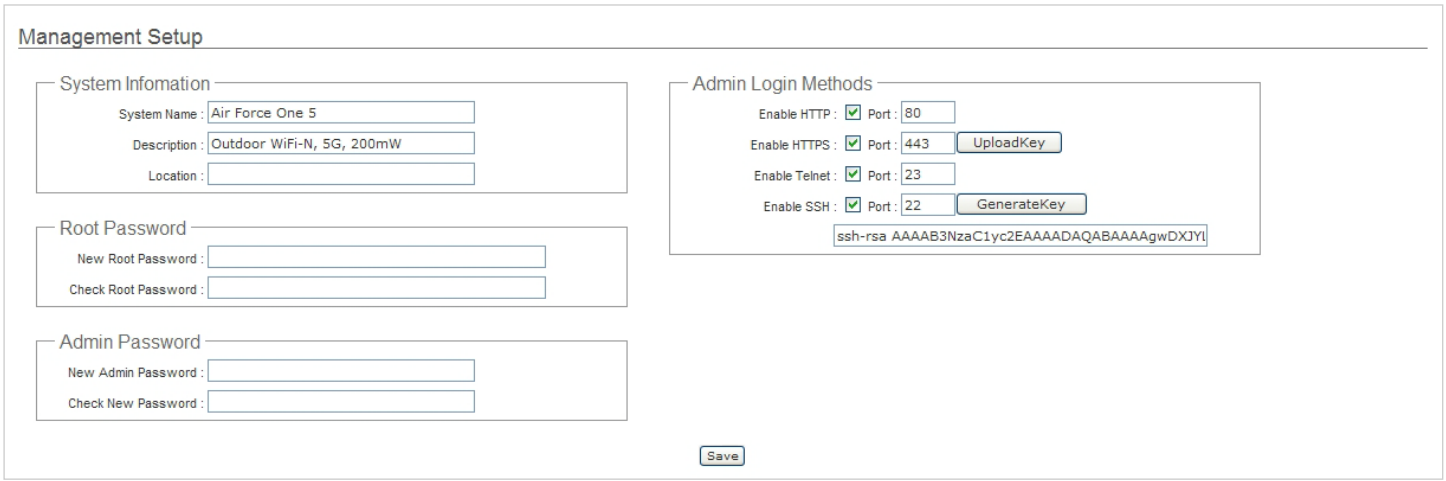
MAC Access Control is the weakest security approach. WPA or WPA2 security methods should be used when possible.

6.4 System Management

6.4.1 Configuration Management

The administrator can later obtain the geographical location of the system via the information configured here. The administrator also can change system password and configure system login methods.

Please click **System -> Management** and follow the below settings.



- **System Information**
  - ➔ **System Name :** Enter a desired name or use the default provided.
  - ➔ **Description :** Denote further information of the system.
  - ➔ **Location :** Enter related geographical location information of the system; administrator/manager will be able to locate the system easily.

The system supports **two** management accounts, root and admin. The system manager is assigned with full administrative privileges when logging in with the **root** account where the root manager can manage the system in any respect. However, when the system manager logs in via the **admin** account, only basic maintenance can be performed. Therefore, manager with different accounts will have different levels of privileges such as changing passwords; root manager can change passwords for both root account and admin account, however, admin manager can only maintain its own password. For more information on the respective privileges of these two management accounts, please refer to

Appendix C. System Manager Privileges.

- **Root Password :** The **root** manager can change its respective password. Enter the new password, and then verify the new password in the Check New Password filed. Click ***Save*** button to activate the new password.
  - ➔ **New Password :** Please input the new password of administrator.
  - ➔ **Check New Password :** Please input again the new password of administrator.
- **Admin Password :** The **admin** manager can change its respective password. Enter the new password, and then verify the new password in the Check New Password filed. Click ***Save*** button to activate the new password.
  - ➔ **New Password :** Please input the new password of administrator.
  - ➔ **Check New Password :** Please input again the new password of administrator.
  - **Admin Login Methods :** The **root** manager can enable or disable system login methods, it can also change services port. Click ***Save*** button to activate the admin login methods.
  - ➔ **Enable HTTP :** Select Enable HTTP to activate HTTP Service
  - ➔ **HTTP Port :** Please input 1 ~ 65535 value to set HTTP Port; default value is 80
  - ➔ **Enable HTTPS :** Select Enable HTTPS to activate HTTPS Service
  - ➔ **HTTPS Port :** Please input 1 ~ 65535 value to set HTTPS Port; default value is 443

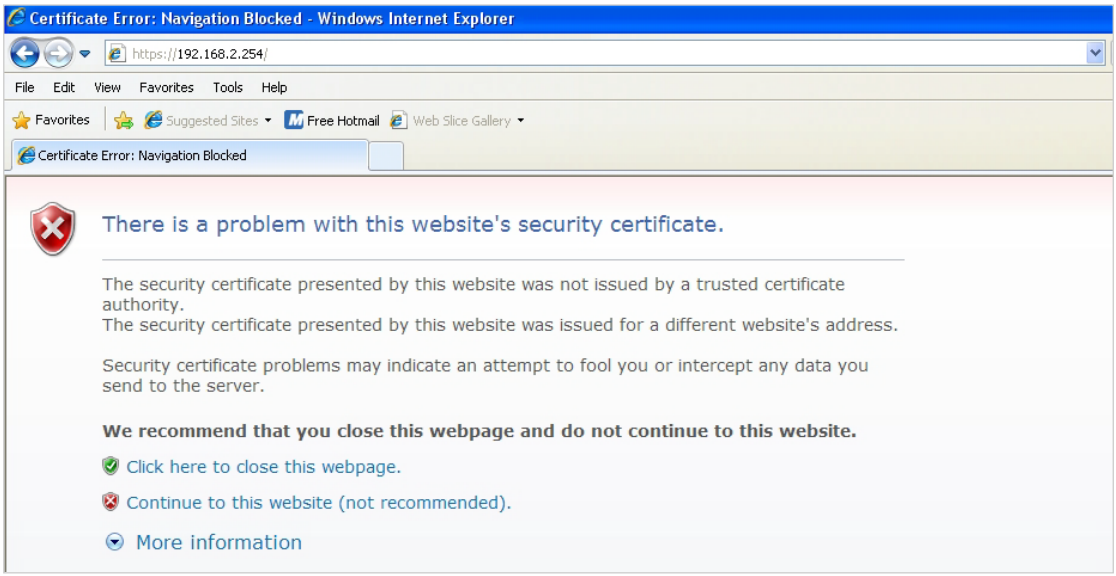
*If you already have an SSL Certificate, please click "**UploadKey**" button to select the file and upload it.*

  - ➔ **Enable Telnet :** Select Enable Telnet to activate Telnet Service
  - ➔ **Telnet Port :** Please input 1 ~ 65535 value to set Telnet Port; default value is 23
  - ➔ **Enable SSH :** Select Enable SSH to activate SSH Service
  - ➔ **SSH Port :** Please input 1 ~ 65535 value to set SSH Port; default value is 22

*Click "**GenerateKey**" button to generate RSA private key. The "Display the host key footprint" gray blank will be show content of RSA key.*

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes

Without a valid certificate, users may encounter the following problem in IE7 when they try to access system's WMI (https://192.168.2.254). There will be a “Certificate Error”, because the browser treats system as an illegal website.

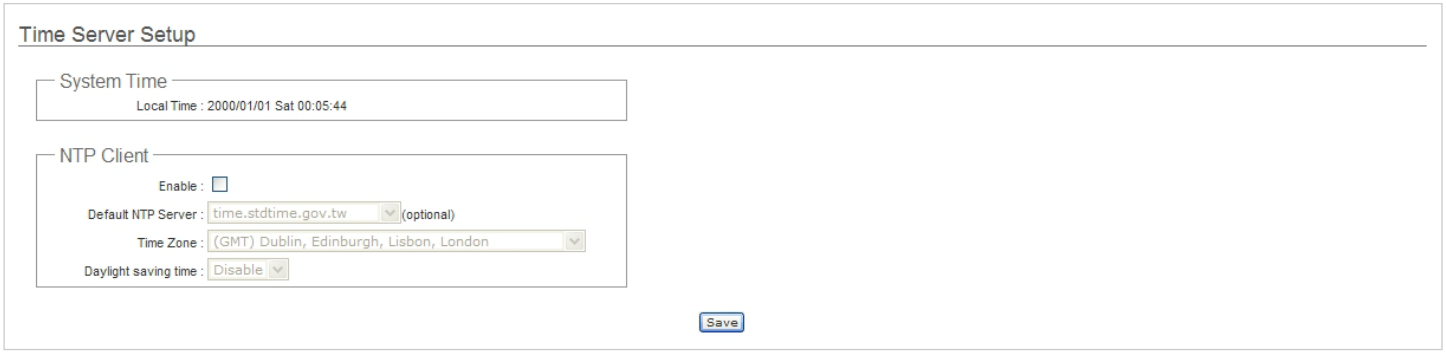

Certificate Error: Navigation Blocked - Windows Internet Explorer
https://192.168.2.254/
File Edit View Favorites Tools Help
Favorites
Suggested Sites
Free Hotmail
Web Slice Gallery
Certificate Error: Navigation Blocked
There is a problem with this website's security certificate.
The security certificate presented by this website was not issued by a trusted certificate authority.
The security certificate presented by this website was issued for a different website's address.
Security certificate problems may indicate an attempt to fool you or intercept any data you send to the server.
We recommend that you close this webpage and do not continue to this website.
Click here to close this webpage.
Continue to this website (not recommended).
More information

Click “***Continue to this website***” to access the system's WMI. The system's Overview page will appear.

6.4.2 Configure System Time

System time can be configured via this page where manual setting and NTP server configuration are both supported.

Please click on **System -> Time Server** and follow the below setting.



- **Local Time :** Display the current time of the system.

- **NTP Client :** Enable Network Time Protocol, NTP, to synchronize the system time with NTP server.
  - ➔ **Default NTP Server :** Select the NTP Server from the drop-down list.
  - ➔ **Time Zone :** Please set a time zone from where the accurate time can be supplied, **(GMT+08:00) Taipei** for example.
  - ➔ **Daylight saving time :** Enable Daylight saving time from where the accurate time needed.

If the current time of the system is incorrect, please verify your network settings, like default Gateway and DNS settings

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes

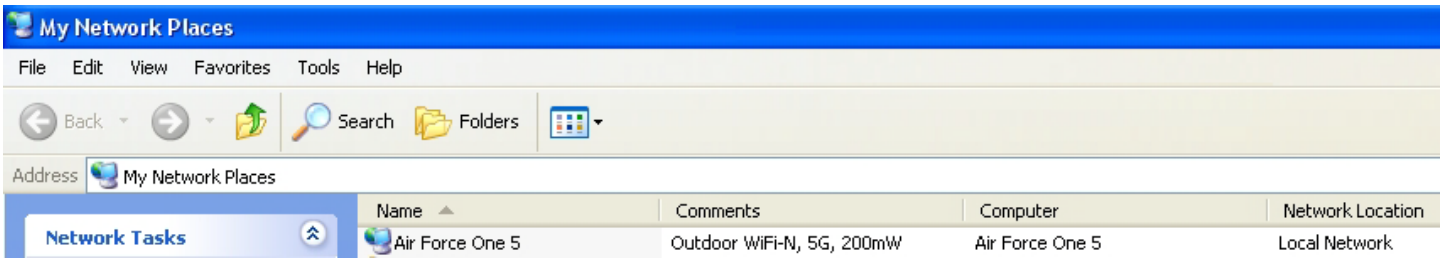
6.4.3 Configure UPnP

UPnP(Universal Plug and Play) is architecture for pervasive peer-to-peer network connectivity of PCs and intelligent devices or appliances, particularly within the home. UPnP builds on Internet standards and technologies, such as TCP/IP, HTTP, and XML, to enable these devices automatically connect with one another and work together to make networking – particularly home networking – possible for more people. Default: **Disable**.

- **UPnP :** Click "**Enable**" to activate UPnP Service or "**Disable**" to deactivate. The default is Disable.

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes

For UPnP to work in Windows XP, the "Air Force One 5" must be available in "***My Network Places***", as shown here: (your specific model may vary)

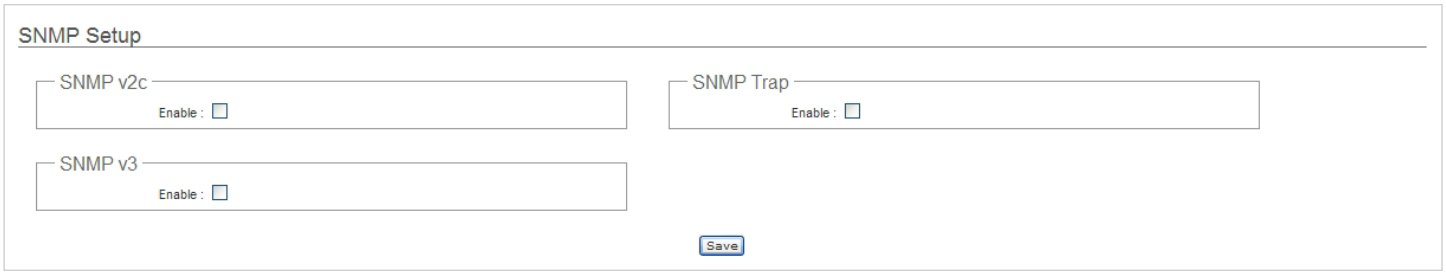


If these devices are not available, you should verify that the correct components and services are loaded in Windows XP. Please refer to ***Appendix D. Using UPnP on Windows XP***

6.4.4 Configure SNMP Setup

SNMP is an application-layer protocol that provides a message format for communication between SNMP managers and agents. By enabling SNMP function, the administrator can obtain the system information remotely.

Please click on **System -> SNMP Setup** and follow the below setting.



- **v2c :** Check “Enable” button to activate SNMP v2c agent or unchecked to deactivate this function.

  - ➔ **ro community :** Enter the community strings that allows read-only access to the system's SNMP information.
  - ➔ **rw community :** Enter the community strings that allows read/write access to the system's SNMP information.

- **v3 :** Check “Enable” button to activate SNMP v3 agent or unchecked to deactivate this function. SNMPv3 supports the highest available levels of security for SNMP communication.

- ➔ **SNMP ro user :** Enter the community strings that allows read-only access to the system's SNMP information.
- ➔ **SNMP ro password :** Enter the password that allows read-only access to the system's SNMP information.
- ➔ **SNMP rw user :** Enter the community strings that allows read/write access to the system's SNMP information.
- ➔ **SNMP rw password :** Enter the password that allows read/write access to the system's SNMP information.

■ **SNMP Trap :** Events on cold start, interface up & down, and association & disassociation can be reported via this function to an assigned server.

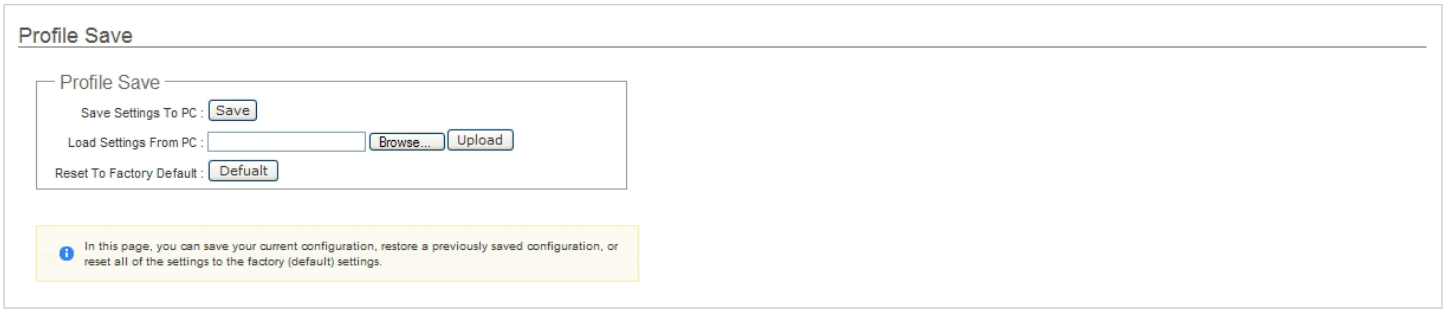
- ➔ **Community :** Enter the community strings required by the remote host computer that will receive trap messages or notices send by the system.
- ➔ **IP :** Enter the IP address of the remote host computer that will receive the trap messages.

Change these settings as described here and click ***Save*** button to save your changes. Click ***Reboot*** button to activate your changes

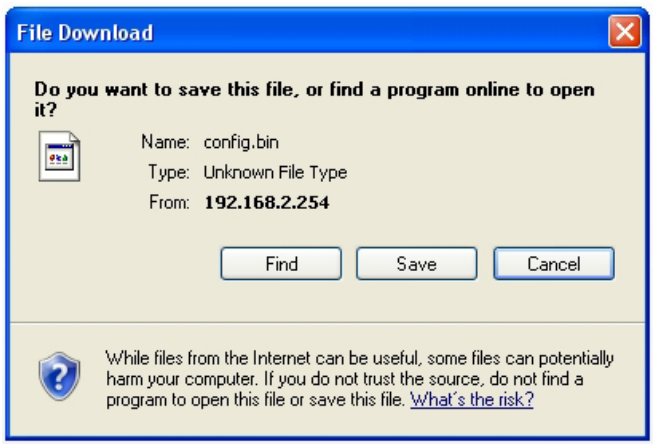
6.4.5 Backup / Restore and Reset to Factory

Current settings on the system can be backed up, or previous backed up settings can be restored as well as resetting the system back to factory default can be performed via this page.

Please click on **Utilities -> Profile Setting** and follow the below setting.


Profile Save
Profile Save
Save Settings To PC :
Save
Load Settings From PC :
Browse...
Upload
Reset To Factory Default :
Default
In this page, you can save your current configuration, restore a previously saved configuration, or reset all of the settings to the factory (default) settings.

- **Save Settings to PC :** Click ***Save*** button to save the current system settings to a local disk, i.e. the HDD of a local computer or Compact Disc.


File Download
Do you want to save this file, or find a program online to open it?
Name: config.bin
Type: Unknown File Type
From: 192.168.2.254
Find
Save
Cancel
While files from the Internet can be useful, some files can potentially harm your computer. If you do not trust the source, do not find a program to open this file or save this file. What's the risk?

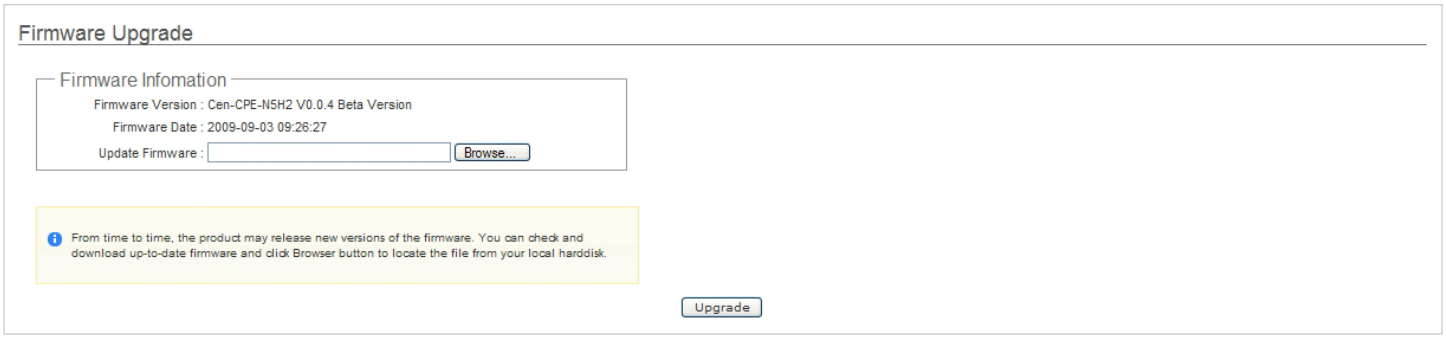
- **Load Settings from PC :** Click ***Browse*** button to search for a previously saved backup file, and then click ***Upload*** button to upload the settings; the system will then be configured to the same settings as specified by the backup file.

- **Reset To Factory Default :** Click ***Default*** button to load the factory default settings of "Air Force One 5", and then **Success Message** page appears. Click ***Reboot*** button to set default configuration.

6.4.6 Firmware Upgrade

Firmware is the main software image, which the system needs to perform all tasks in real time. Firmware upgrades are required for adding new features or to resolves bugs. It takes about **2 minutes** to upload/ upgrade flash and be patient please.

To upgrade the system firmware, click ***Browse*** to search for the new firmware file, and then click ***Upgrade*** button to execute the upgrade process.

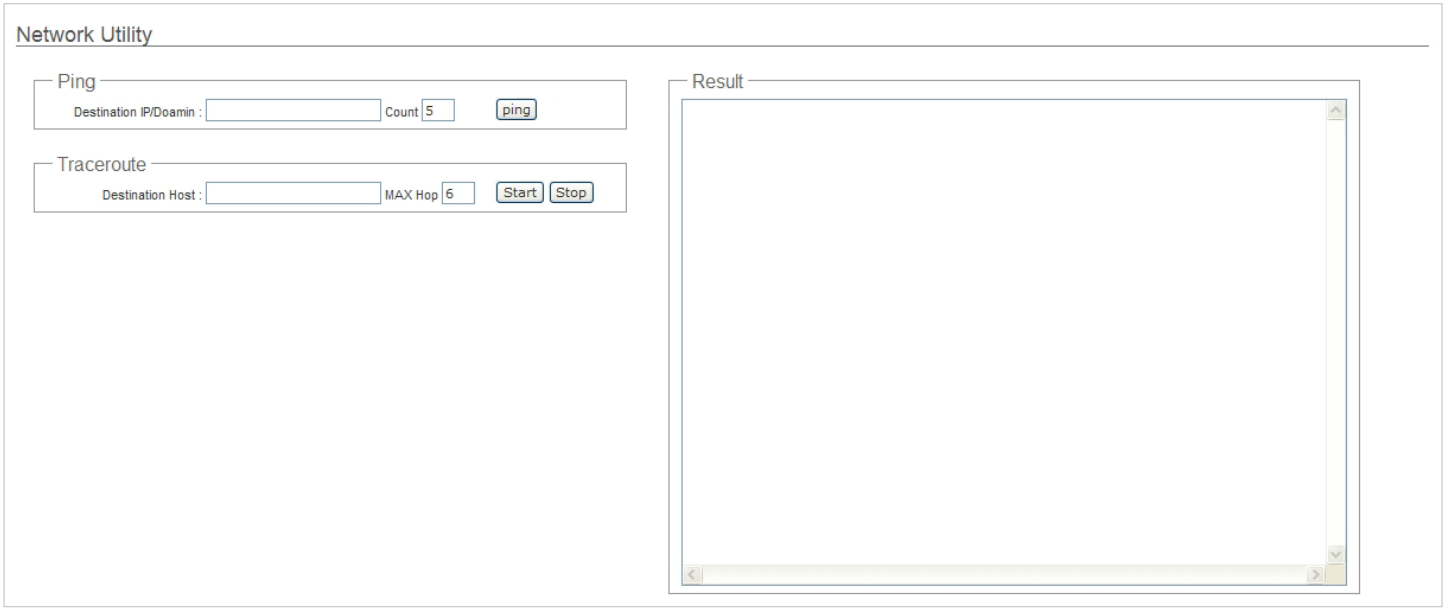

Firmware Upgrade
Firmware Infomation
Firmware Version : Cen-CPE-N5H2 V0.0.4 Beta Version
Firmware Date : 2009-09-03 09:26:27
Update Firmware :
Browse...
From time to time, the product may release new versions of the firmware. You can check and download up-to-date firmware and click Browser button to locate the file from your local harddisk.
Upgrade

1. *To prevent data loss during firmware upgrade, please back up the current settings before proceeding to firmware upgrade.*
2. *During the upgrading. Do not interrupt the system, i.e. power on/off, during the upgrading process or the restarting process as this may damage system.*

6.4.7 Network Utility

The administrator can diagnose the network connectivity via this function.

Please click on **Utilities -> Network Utility** and follow the below setting.



- **Ping :** This utility will ping other devices on the network directly form the “Air Force One 5” device.

  Ping utility should be used for the preliminary link quality and packet latency estimation between two network devices using the ICMP packets. Packet loss statistics and latency time evaluation is provided after the test is completed.

  ➔ **Destination IP/Domain :** Enter the desired domain name or IP address of the target device for diagnosis purpose, i.e. www.google.com, and click ***ping*** button to proceed. The ping result will be shown in the **Result** field.

  ➔ **Count :** Estimation is done after the number of ICMP packets; default is 5, maximum is 50.

- **Traceroute :** Allows tracing the hops from the “Air Force One 5” device to a selected outgoing IP address. It should be used for the finding the route taken by ICMP packets across the network to the destination host.

  ➔ **Destination Host :** Specifies the Destination Host for the finding the route taken by ICMP packets across the network.

  ➔ **MAX Hop :** Specifies the maximum number of hops(max time-to-live value) traceroute will probe.

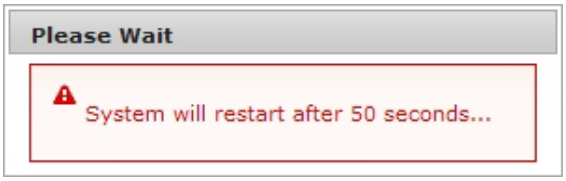
The test is started using the **Start** button, click Stop button to stopped test

6.4.8 Reboot

This function allows the administrator to safely restart the "Air Force One 5". Click ***Reboot*** to restart the system immediately, and the whole process will take about three minutes to complete.

Reboot
You must be reboot the system after changing settings. Rebooting the system will not delete any of your configuration settings. Click reboot button to reboot the system.
Reboot

The Pop-up Restart window as displayed below appears during the rebooting period. If turning off the power is necessary, please allow the restart process to be completed before turning off the system.



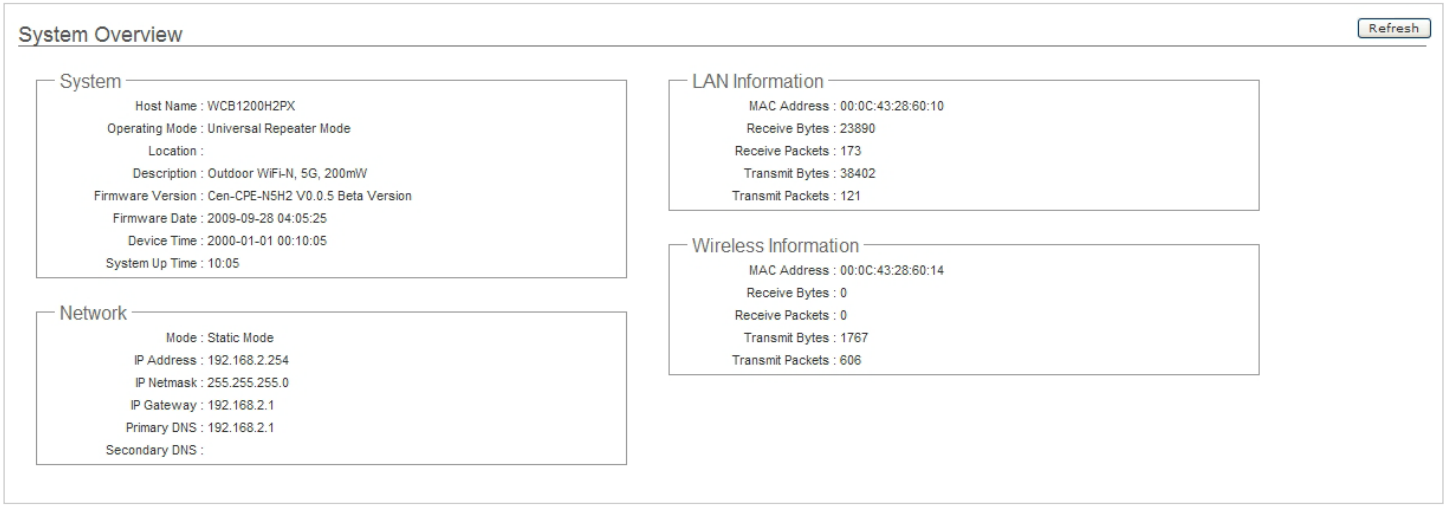
The **System Overview** page appears upon the completion of reboot.

6.5 Observer Status

Information of current system settings can be over viewed via this page; statuses of **Overview**, **Clients**, **Remote AP**, **Extra Info** and **Event Log** are displayed in this interface.

6.5.1 System Overview

Detailed information on **System**, **Network**, **LAN Information** and **Wireless Information** can be reviewed via this page.



- **System :** Display the information of the system.
  - ➔ **System Name :** The name of the system.
  - ➔ **Operating Mode :** The mode currently in service.
  - ➔ **Location :** The reminding note on the geographical location of the system.
  - ➔ **Description :** The reminding note of the system.
  - ➔ **Firmware Version :** The current firmware version installed.
  - ➔ **Firmware Date :** The build time of the firmware installed.
  - ➔ **Device Time :** The current time of the system.
  - ➔ **System Up Time :** The time period that the system has been in service since last boot-up.

- **Network Information :** Display the information of the Network.

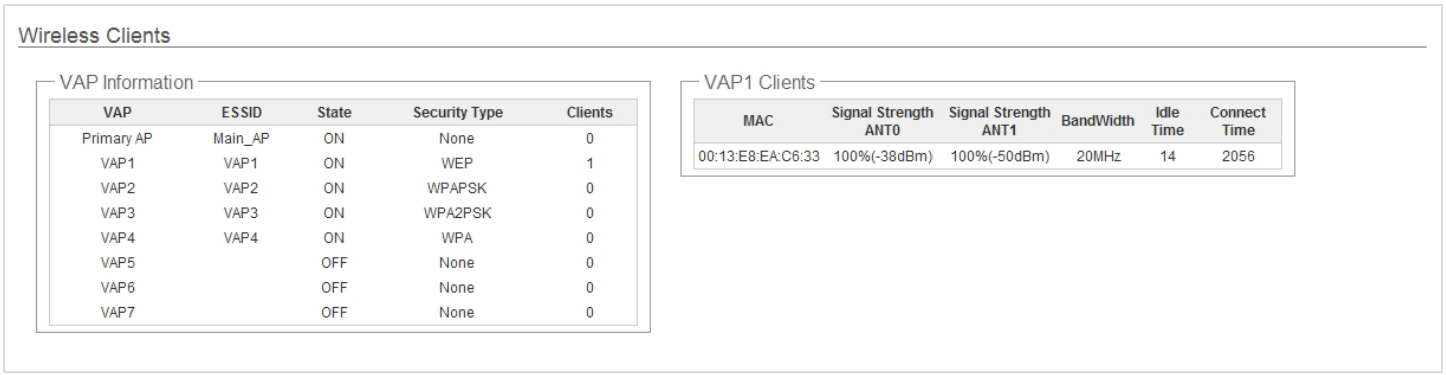
- ➔ **Mode :** The current mode of the LAN port.
- ➔ **IP Address :** The IP address of the LAN port.
- ➔ **IP Netmask :** The IP netmask of the LAN port.
- ➔ **IP Gateway :** The gateway IP address of the LAN port.
- ➔ **Primary DNS :** The current primary DNS server of the system.
- ➔ **Secondary DNS :** The current secondary DNS server of the system.

- **LAN Information :** Display the detailed receive and transmit statistics of LAN interface.
  - ➔ **MAC Address :** The MAC address of the LAN port.
  - ➔ **Receive bytes :**The current receive bytes of the LAN port.
  - ➔ **Receive packets :** The current receive packets of the LAN port.
  - ➔ **Transmit bytes :** The current transmit bytes of the LAN port.
  - ➔ **Transmit packets :** The current transmit packets of the LAN port.

- **Wireless Information :** Display the detailed receive and transmit statistics of Wireless interface.
  - ➔ **MAC Address :** The MAC address of the Wireless port.
  - ➔ **Receive bytes :**The current receive bytes of the Wireless port.
  - ➔ **Receive packets :** The current receive packets of the Wireless port.
  - ➔ **Transmit bytes :** The current transmit bytes of the Wireless port.
  - ➔ **Transmit packets :** The current transmit packets of the Wireless port.

6.5.2 Associated Clients Status

The administrator can obtain detailed Information such as VAP, ESSID, MAC Address, Status, and Security Type of all associated clients via this page.

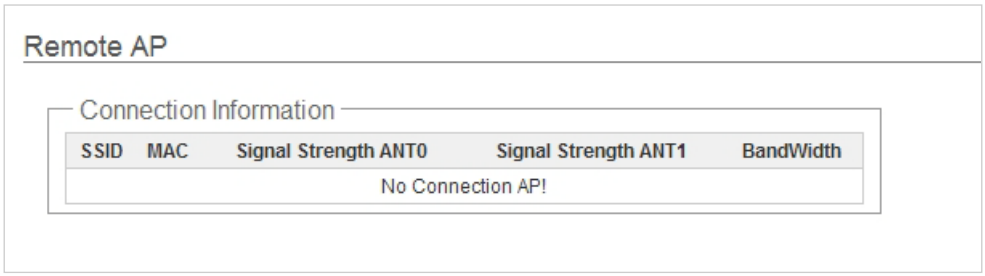

Wireless Clients
VAP Information
VAP ESSID State Security Type Clients
Primary AP Main_AP ON None 0
VAP1 VAP1 ON WEP 1
VAP2 VAP2 ON WPAPSK 0
VAP3 VAP3 ON WPA2PSK 0
VAP4 VAP4 ON WPA 0
VAP5 OFF None 0
VAP6 OFF None 0
VAP7 OFF None 0
VAP1 Clients
MAC Signal Strength ANT0 Signal Strength ANT1 BandWidth Idle Time Connect Time
00:13:E8:EA:C6:33 100%(-38dBm) 100%(-50dBm) 20MHz 14 2056

- **VAP Information :** Display all Virtual AP's information
  - ➔ **VAP :** Indicate the system's Virtual AP
  - ➔ **ESSID :** Indicate the ESSID of the respective Virtual AP
  - ➔ **Status :** Indicate the Status of the respective Virtual AP
  - ➔ **Security Type :** Indicate the security type of the respective Virtual AP used.
  - ➔ **Clients :** Indicate the number of connection on the respective Virtual AP.

- **VAP Clients :** Display all associated clients on each Virtual AP
  - ➔ **MAC :** indicate the MAC address of the respective client's association.
  - ➔ **Signal Strength ANT0/ANT1 :** Indicate the signal strength of the respective client's association.
  - ➔ **Bandwidth :** Indicate the channel bandwidth of the respective client's association.
  - ➔ **Idle Time :** Time period the associated client is inactive (units in seconds).
  - ➔ **Connect Time :** Time period the associated client is connection (units in seconds).

6.5.3 Remote AP

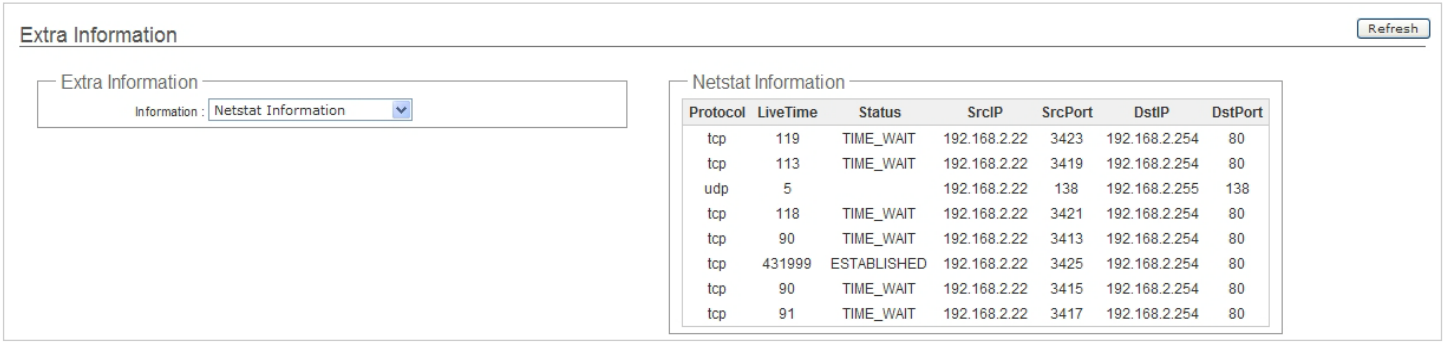
The administrator can get Connection information via this page.



- **SSID :** Shows the current SSID, which must be the same on the wireless client and AP in order for communication to be established.
- **MAC :** Shows the associated BSSID, which can be used to identify the wireless access point.
- **Signal Strength ANT0/ANT1 :** Shows the wireless signal strength of the connection between system and an access point.
    - **BandWidth :** Shows current channel bandwidth of the connection between system and an access point.

6.5.4 Extra Information

The administrator can get current device usage statistics and status of the system components from drop-down list.

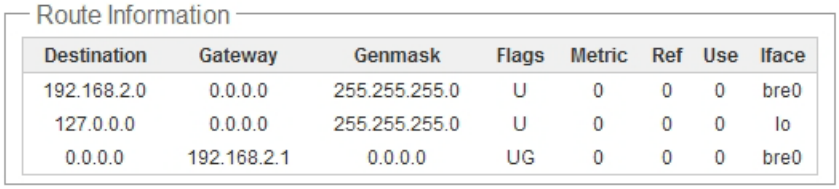


- **Show Netstat Information :** Select "**NetStatus Information**" on the drop-down list, the connection track list should show-up, the list can be updated using the Refresh button.

  NetStatus will show all connection track on the system, the information include *Protocol* , *Live Time* , *Status* , *Source/Destination IP address* and *Port*.

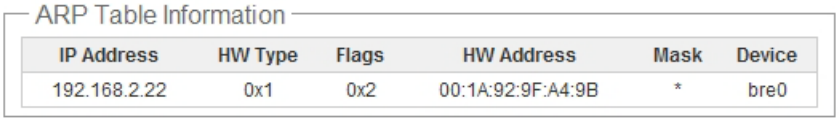
- **Show Route Information :** Select "**Route Information**" on the drop-down list, the route table should shown-up, the list can be updated using the Refresh button.

  "Air Force One 5" examines the destination IP address of each data packet traveling through the system and chooses the appropriate interface to forward the packet to. The system choice depends on static routing rules – entries, which are registered in system routing table. Static routes to specific hosts, networks or default gateway are set up automatically according to the IP configuration of all the system's interfaces.


Route Information
Destination Gateway Genmask Flags Metric Ref Use Iface
192.168.2.0 0.0.0.0 255.255.255.0 U 0 0 0 bre0
127.0.0.0 0.0.0.0 255.255.255.0 U 0 0 0 lo
0.0.0.0 192.168.2.1 0.0.0.0 UG 0 0 0 bre0

- **Show ARP Information :** Select "**ARP Table Information**" on the drop-down list, the ARP table should show-up, the list can be updated using the Refresh button.

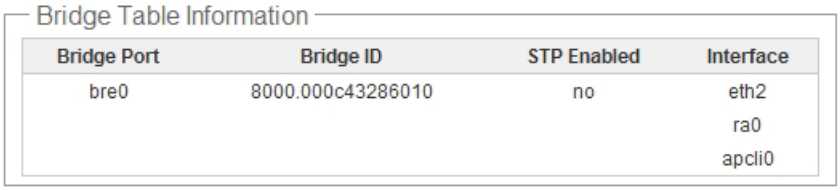
  ARP is used to associate each IP address to the unique hardware address (MAC) the devices. It is important to have unique IP addresses for each MAC or else there will be ambiguous routes in the network.


ARP Table Information

IP Address	HW Type	Flags	HW Address	Mask	Device
192.168.2.22	0x1	0x2	00:1A:92:9F:A4:9B	*	bre0

- **Show Bridge Table Information :** Select "Bridge Table Information " on the drop-down list, the bridge table should show-up, the list can be updated using the Refresh button.

  Bridge table will show Bridge ID and STP's Status on the each Ethernet bridge and its attached interfaces, the Bridge Port should be attached to some interfaces.


Bridge Table Information

Bridge Port	Bridge ID	STP Enabled	Interface
bre0	8000.000c43286010	no	eth2
			ra0
			apcli0

- **Show MAC Information :** Select "**Bridge MACs Information**" on the drop-down list, all the list of MAC address should show up on the bridge table, the list can be updated using the Refresh button.

  Bridge MACs shows to which Bridge Port the particular station is associated to - in other words from which Interface (Ethernet or wireless) the network device (defined by MAC address) is reachable to the system while forwarding the

packets to that port only (thus saving a lot of redundant copies and transmits).

Ageing timer shows ageing time for each address entry (in seconds) - after particular time out, not having seen a packet coming from a certain address, the bridge will delete that address from the Bridge Table.

Bridge MACs Information

Port No	MAC Address	Local	Ageing Timer
1	00:0c:43:28:80:08	yes	0.00
2	00:0c:43:28:80:80	yes	0.00
1	00:1a:92:9f:a4:9b	no	0.03

- **Show STP Information :** Select "**Bridge STP Information**" on the drop-down list, all the list of STP information should show up on the STP table.

Bridge STP Information

bre0			
bridge id	8000.000c43286010		
designated root	8000.000c43286010		
root port	0	path cost	0
max age	20.00	bridge max age	20.00
hello time	2.00	bridge hello time	2.00
forward delay	15.00	bridge forward delay	15.00
ageing time	300.00		
hello timer	1.36	tcn timer	0.00
topology change timer	0.00	gc timer	3.36
flags			

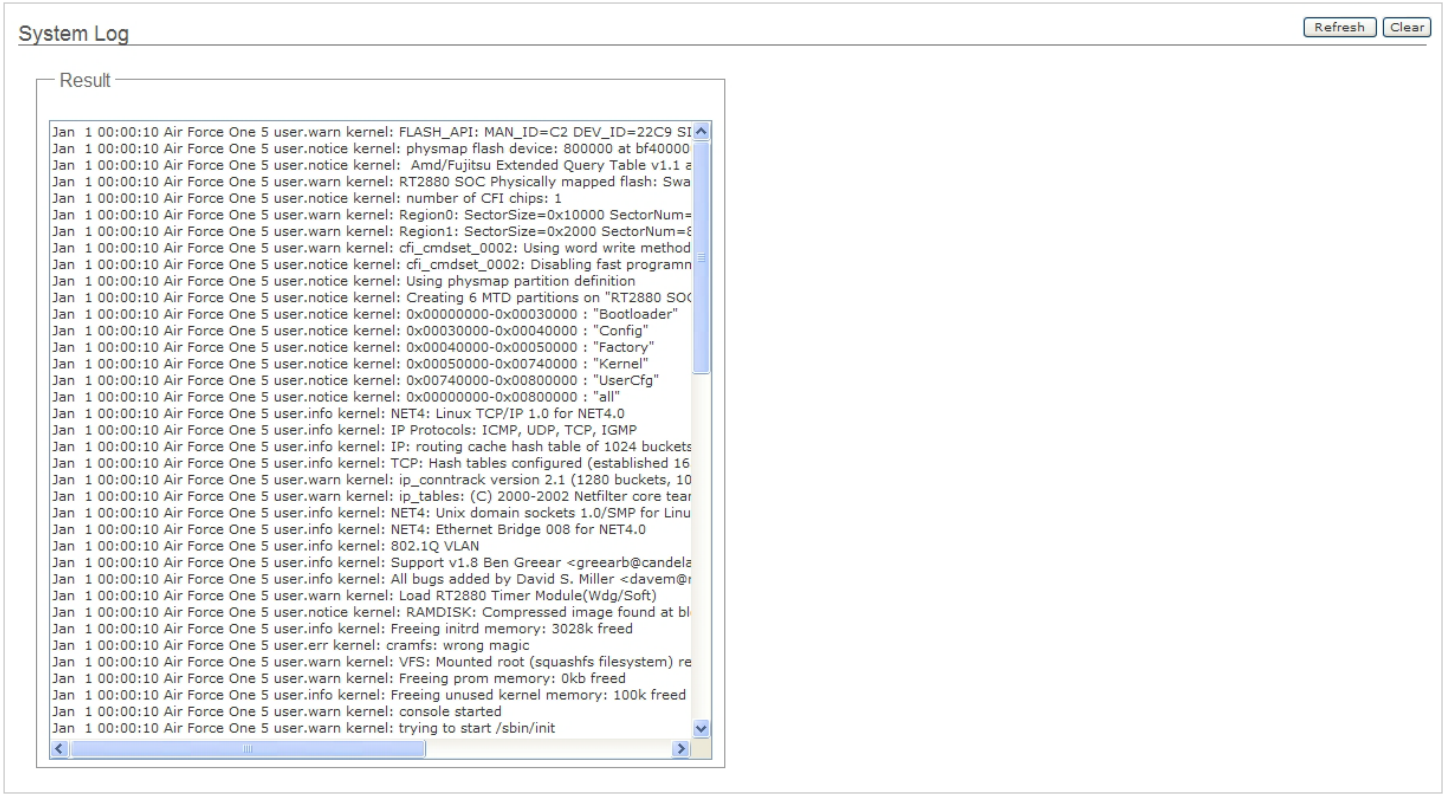
eth2 (1)			
port id	8001	state	forwarding
designated root	8000.000c43286010	path cost	100
designated bridge	8000.000c43286010	message age timer	0.00
designated port	8001	forward delay timer	0.00
designated cost	0	hold timer	0.00
flags			

ra0 (2)			
port id	8002	state	forwarding
designated root	8000.000c43286010	path cost	100
designated bridge	8000.000c43286010	message age timer	0.00
designated port	8002	forward delay timer	0.00
designated cost	0	hold timer	0.00
flags			

apcli0 (3)			
port id	8003	state	forwarding
designated root	8000.000c43286010	path cost	100
designated bridge	8000.000c43286010	message age timer	0.00
designated port	8003	forward delay timer	0.00
designated cost	0	hold timer	0.00
flags			

6.5.5 Event Log

The reported system events can be reviewed here.


System Log
Refresh
Clear
Result
Jan 1 00:00:10 Air Force One 5 user.warn kernel: FLASH_API: MAN_ID=C2 DEV_ID=22C9 SI
Jan 1 00:00:10 Air Force One 5 user.notice kernel: physmap flash device: 800000 at bf40000
Jan 1 00:00:10 Air Force One 5 user.notice kernel: Amd/Fujitsu Extended Query Table v1.1 a
Jan 1 00:00:10 Air Force One 5 user.warn kernel: RT2880 SOC Physically mapped flash: Swa
Jan 1 00:00:10 Air Force One 5 user.notice kernel: number of CFI chips: 1
Jan 1 00:00:10 Air Force One 5 user.warn kernel: Region0: SectorSize=0x10000 SectorNum=
Jan 1 00:00:10 Air Force One 5 user.warn kernel: Region1: SectorSize=0x2000 SectorNum=8
Jan 1 00:00:10 Air Force One 5 user.warn kernel: cfi_cmdset_0002: Using word write method
Jan 1 00:00:10 Air Force One 5 user.notice kernel: cfi_cmdset_0002: Disabling fast programn
Jan 1 00:00:10 Air Force One 5 user.notice kernel: Using physmap partition definition
Jan 1 00:00:10 Air Force One 5 user.notice kernel: Creating 6 MTD partitions on "RT2880 SO
Jan 1 00:00:10 Air Force One 5 user.notice kernel: 0x00000000-0x00030000 : "Bootloader"
Jan 1 00:00:10 Air Force One 5 user.notice kernel: 0x00030000-0x00040000 : "Config"
Jan 1 00:00:10 Air Force One 5 user.notice kernel: 0x00040000-0x00050000 : "Factory"
Jan 1 00:00:10 Air Force One 5 user.notice kernel: 0x00050000-0x00740000 : "Kernel"
Jan 1 00:00:10 Air Force One 5 user.notice kernel: 0x00740000-0x00800000 : "UserCfg"
Jan 1 00:00:10 Air Force One 5 user.notice kernel: 0x00000000-0x00800000 : "all"
Jan 1 00:00:10 Air Force One 5 user.info kernel: NET4: Linux TCP/IP 1.0 for NET4.0
Jan 1 00:00:10 Air Force One 5 user.info kernel: IP Protocols: ICMP, UDP, TCP, IGMP
Jan 1 00:00:10 Air Force One 5 user.info kernel: IP: routing cache hash table of 1024 buckets
Jan 1 00:00:10 Air Force One 5 user.info kernel: TCP: Hash tables configured (established 16
Jan 1 00:00:10 Air Force One 5 user.warn kernel: ip_conntrack version 2.1 (1280 buckets, 10
Jan 1 00:00:10 Air Force One 5 user.warn kernel: ip_tables: (C) 2000-2002 Netfilter core tear
Jan 1 00:00:10 Air Force One 5 user.info kernel: NET4: Unix domain sockets 1.0/SMP for Linu
Jan 1 00:00:10 Air Force One 5 user.info kernel: NET4: Ethernet Bridge 008 for NET4.0
Jan 1 00:00:10 Air Force One 5 user.info kernel: 802.1Q VLAN
Jan 1 00:00:10 Air Force One 5 user.info kernel: Support v1.8 Ben Greear <greearb@candela
Jan 1 00:00:10 Air Force One 5 user.info kernel: All bugs added by David S. Miller <davem@r
Jan 1 00:00:10 Air Force One 5 user.warn kernel: Load RT2880 Timer Module(Wdg/Soft)
Jan 1 00:00:10 Air Force One 5 user.notice kernel: RAMDISK: Compressed image found at bl
Jan 1 00:00:10 Air Force One 5 user.info kernel: Freeing initrd memory: 3028k freed
Jan 1 00:00:10 Air Force One 5 user.err kernel: cramfs: wrong magic
Jan 1 00:00:10 Air Force One 5 user.warn kernel: VFS: Mounted root (squashfs filesystem) re
Jan 1 00:00:10 Air Force One 5 user.warn kernel: Freeing prom memory: 0kb freed
Jan 1 00:00:10 Air Force One 5 user.info kernel: Freeing unused kernel memory: 100k freed
Jan 1 00:00:10 Air Force One 5 user.warn kernel: console started
Jan 1 00:00:10 Air Force One 5 user.warn kernel: trying to start /sbin/init

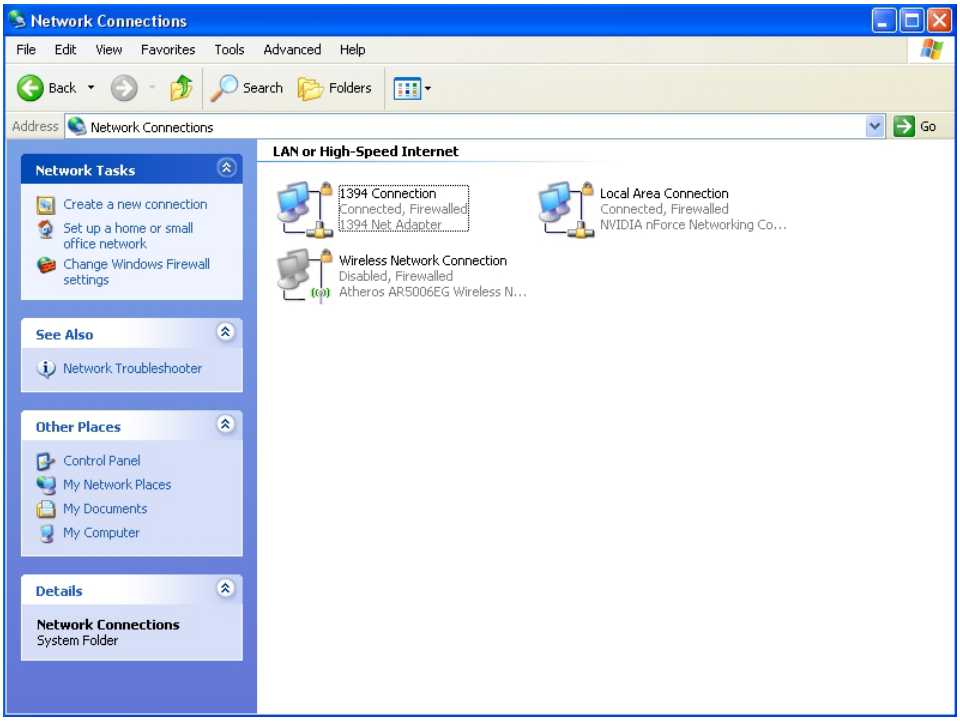
- **Date/ Time:** The date and time when the event occurred.
- **Hostname:** The name of the host which records the event. It helps the administrator identify the source of the reported events.
- **Process name (with square brackets):** Indicate the process with which the specific event is associated.
- **Description:** Description of the event.

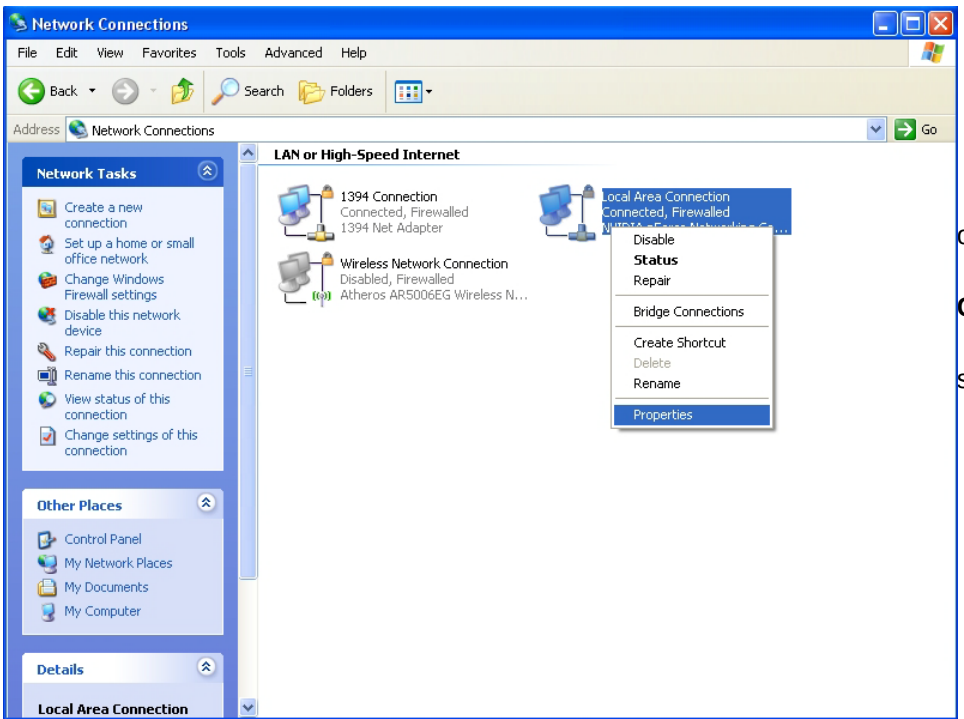
Click ***Refresh*** button to renew the log, or click ***Clear*** button to clear all the record.

Appendix A. Windows TCP/IP Settings

■ Windows XP

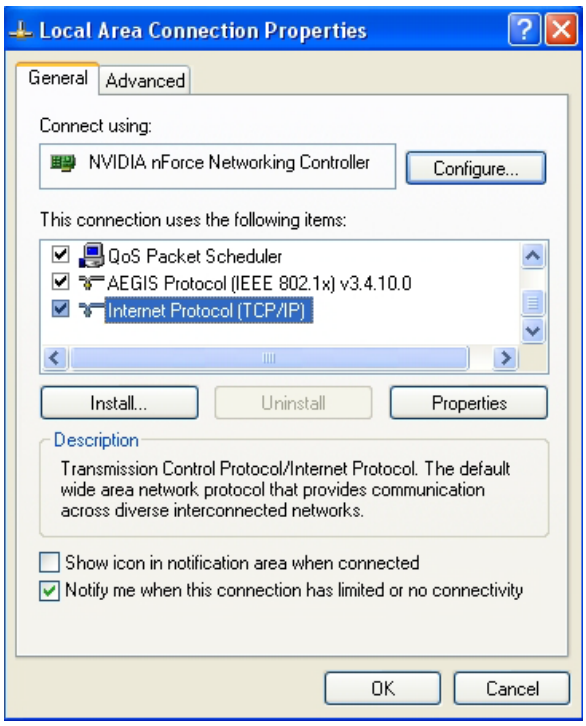
1. Click **Start -> Settings -> Control Panel**, and then "**Control Panel**" window appears. Click on "**Network Connections**", and then "**Network Connections**" window appears.





2. Click right on "**Local Area Connection**", and select ***Properties***.

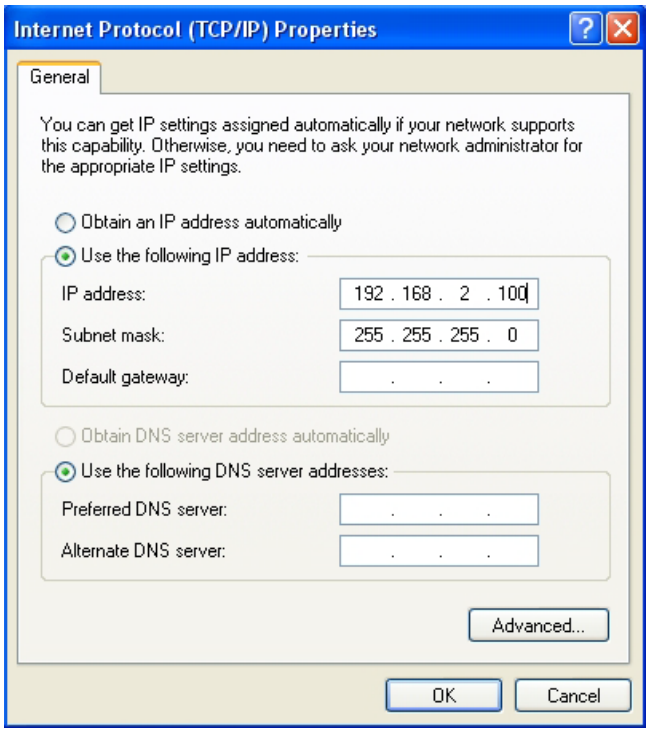
3. In “**Local Area Connection Properties**” window, select “**Internet Protocol (TCP/IP)**” and click on ***Properties*** button.



4. Select “Use the following IP address”, and type in

   IP address : 192.168.2.100

   Subnet mask : 255.255.255.0


Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
192 . 168 . 2 . 100
Subnet mask:
255 . 255 . 255 . 0
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

Appendix B. Valid Characters when using WMI

Table B Valid Characters for using WMI

Block	Field	Valid Characters
LAN	IP Address	IP Format; 1-254
	IP Netmask	128.0.0.0 ~ 255.255.255.252
	IP Gateway	IP Format; 1-254
	Primary	IP Format; 1-254
	Secondary	IP Format; 1-254
	Hostname	Length : 32 0-9, A-Z, a-z @ - _ .
WAN	Manual MAC Address	12 HEX chars
	IP Address	IP Format; 1-254
	IP Netmask	128.0.0.0 ~ 255.255.255.252
	IP Gateway	IP Format; 1-254
	Hostname	Length : 32 0-9, A-Z, a-z @ - _ .
	User name	Length : 32 0-9, A-Z, a-z ~ ! @ # $ % ^ * ( ) _ + - { } | : < > ? [ ] / ; ` , . =
	Password	
	MTU	576 ~ 1492
	Idle Time	0 ~ 60 minutes
	Primary DNS	IP Format; 1-254
	Secondary DNS	IP Format; 1-254
DDNS	Hostname	Length : 32 0-9, A-Z, a-z @ - _ .
	User Name	Length : 32 0-9, A-Z, a-z ~ ! @ # $ % ^ * ( ) _ + - { } | : < > ? [ ] / ; ` , . =
	Password	
DHCP Server	Start IP	IP Format; 1-254
	End IP	IP Format; 1-254
	DNS1 IP	IP Format; 1-254
	DNS2 IP	IP Format; 1-254
	WINS IP	IP Format; 1-254

	Domain	Length : 32 0-9, A-Z, a-z ~ ! @ # $ % ^ * ( ) _ + - { } | : < > ? [ ] / ; ` , . =

Table B Valid Characters for using WMI (continued)

Block	**Field**	**Valid Characters**
Management	System Name	Length : 32 0-9, A-Z, a-z Space ~ ! @ # $ % ^ * ( ) _ + - { } | : < > ? [ ] / ; ` , . =
	Description	Length : 32 0-9, A-Z, a-z Space ~ ! @ # $ % ^ * ( ) _ + - { } | : < > ? [ ] / ; ` , . =
	Location	Length : 32 0-9, A-Z, a-z Space ~ ! @ # $ % ^ * ( ) _ + - { } | : < > ? [ ] / ; ` , . =
	New Password	Length : 4 ~ 30 0-9, A-Z, a-z ~ ! @ # $ % ^ * ( ) _ + - { } | : < > ? [ ] / ; ` , . =
	Check New Password	Length : 4 ~ 30 0-9, A-Z, a-z ~ ! @ # $ % ^ * ( ) _ + - { } | : < > ? [ ] / ; ` , . =
	HTTP Port	1 ~ 65535
	Telnet Port	1 ~ 65535
SNMP	RO community	Length : 32 0-9, A-Z, a-z ~ ! @ # $ % ^ * ( ) _ + - { } | : < > ? [ ] ; ` , . =
	RW community	Length : 32 0-9, A-Z, a-z ~ ! @ # $ % ^ * ( ) _ + - { } | : < > ? [ ] ; ` , . =
	RO user	Length : 31 0-9, A-Z, a-z ~ ! @ # $ % ^ * ( ) _ + - { } | : < > ? [ ] ; ` , . =
	RO password	Length : 8 ~ 32 0-9, A-Z, a-z ~ ! @ # $ % ^ * ( ) _ + - { } | : < > ? [ ] ; ` , . =
	RW user	Length : 31 0-9, A-Z, a-z ~ ! @ # $ % ^ * ( ) _ + - { } | : < > ? [ ] ; ` , . =
	RW password	Length : 8 ~ 32 0-9, A-Z, a-z ~ ! @ # $ % ^ * ( ) _ + - { } | : < > ? [ ] ; ` , . =
	Community	Length : 32 0-9, A-Z, a-z ~ ! @ # $ % ^ * ( ) _ + - { } | : < > ? [ ] ; ` , . =
	IP	IP Format; 1-254

Table B Valid Characters for using WMI (continued)

Block	Field	Valid Characters
General Setup	Tx Power	1-100 %
Wireless Profile (CPE Mode)	Profile Name	Length : 32 0-9, A-Z, a-z Space ~ ! @ # $ % ^ * ( ) _ + - { } | : < > ? [ ] / ; ` , . =
	ESSID	Length : 32 0-9, A-Z, a-z ~ ! @ # $ % ^ * ( ) _ + - { } | : < > ? [ ] / ; ` , . =
	Fragment Threshold	256 ~ 2346
	RTS Threshold	1 ~ 2347
	WEP Key	10, 26 HEX chars or 5, 13 ASCII chars
	Pre-shared Key	8 ~ 63 ASCII chars; 64 HEX chars
Advanced Setup	Beacon Interval	20 ~ 1024
	Date Beacon Rate	1 ~ 255
	Fragment Threshold	256 ~ 2346
	RTS Threshold	1 ~ 2347
Virtual AP Setup	ESSID	Length : 32 0-9, A-Z, a-z ~ ! @ # $ % ^ * ( ) _ + - { } | : < > ? [ ] / ; ` , . =
	Maximum Clients	1 ~ 32
	VLAN ID	1 ~ 4094
	WEP Key	10, 26 HEX chars or 5, 13 ASCII chars
	Group Key Update Period	>=60 seconds
	PMK Cache Period	> 0 minute
	Pre-Shared Key	8 ~ 63 ASCII chars; 64 HEX chars
	Radius Server IP	IP Format; 1-254
	Radius Port	1 ~ 65535
	Shared Secret	8 ~ 64 characters
	Session Timeout	>= 60 seconds; 0 is disable

Table B Valid Characters for using WMI (continued)

Block	Field	Valid Characters
WDS Setup	WEP Key	10, 26 HEX chars or 5, 13 ASCII chars
	TKIP Key	8 ~ 63 ASCII chars; 64 HEX chars
	AES Key	8 ~ 63 ASCII chars; 64 HEX chars
	Peer's MAC Address	12 HEX chars
	Description	Length : 32 0-9, A-Z, a-z Space ~ ! @ # $ % ^ * ( ) _ + - { } | : < > ? [ ] / ; ` , . =
IP Filter	Source Address	IP Format; 1-254
	Source Mask	0 ~ 32
	Source Port	1 ~ 65535
	Destination Address	IP Format; 1-254
	Destination Mask	0 ~ 32
	Destination Port	1 ~ 65535
MAC Filter	MAC address	MAC Format; 12 HEX chars
Virtual Server	Description	Length : 32 0-9, A-Z, a-z space ~ ! @ # $ % ^ * ( ) _ + - { } | : < > ? [ ] / ; ` , . =
	Private IP	IP Formate; 1-254
	Private Port	1 ~ 65535
	Public Port	1 ~ 65535
DMZ	IP Address	IP Format; 1-254
QoS	Comment	Length : 32 0-9, A-Z, a-z space ~ ! @ # $ % ^ * ( ) _ + - { } | : < > ? [ ] / ; ` , . =
	MAC Address	MAC Format; 12 HEX chars
	Source IP	IP Formate; 1-254
	Destination IP	IP Formate; 1-254
	Source Port	1 ~ 65535

Block	Field	Valid Characters
	Destination Port	1 ~ 65535
	Upload & Download	8 ~ 8192 digital number

Appendix C. System Manager Privileges

There are two system management accounts for maintaining the system under CPE mode; namely, the **root** and **admin** accounts are with different levels of privileges. The root manager account is empowered with full privilege while the admin manager account is with partial.

In the other mode, the **admin** account only has **read** privilege.

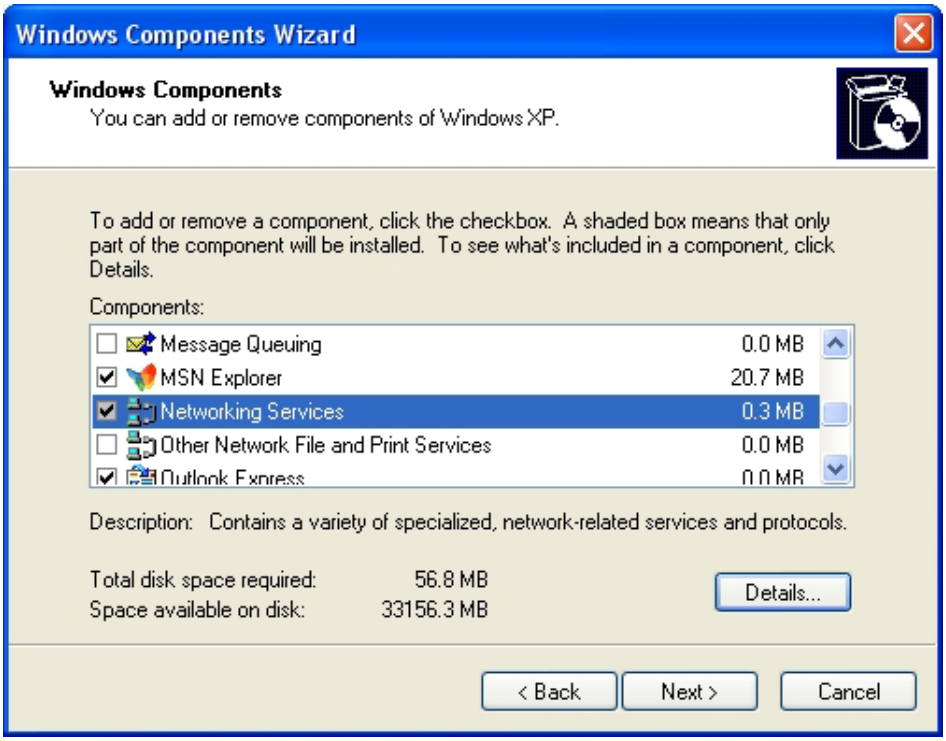
Please refer to the following table for the admin manager account's privileges.

Main Menu	Sub Menu	Group	Admin Privilege
System	Operating Mode		Read
	WAN		Read
	LAN		Read & Write
	DDNS		Read & Write
	Management	System Information	Read
		Root Password	Read
		Admin Password	Read & Write
		Login Methods	Read
	Time		Read & Write
	UPNP		Read & Write
	SNMP		Read
Wireless	General		Read
	Advanced		Read
	Site Survey		Read
Advance	DMZ		Read
	IP Filter		Read
	MAC Filter		Read
	Virutal Server		Read
	QoS		Read
Utilities	Profile Settings	Backup Settings	Read & Write
		Restore Settings	Read
		Reset to Default	Read

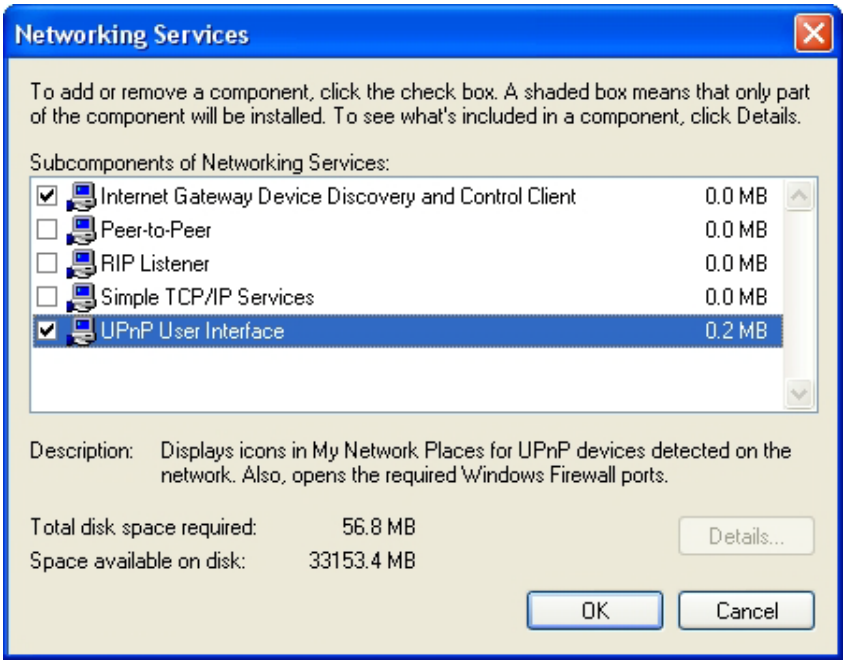
	System Upgrade		Read
	Network Utility		Read & Write
	Reboot		Read & Write

Appendix D. Enabling UPnP in Windows XP

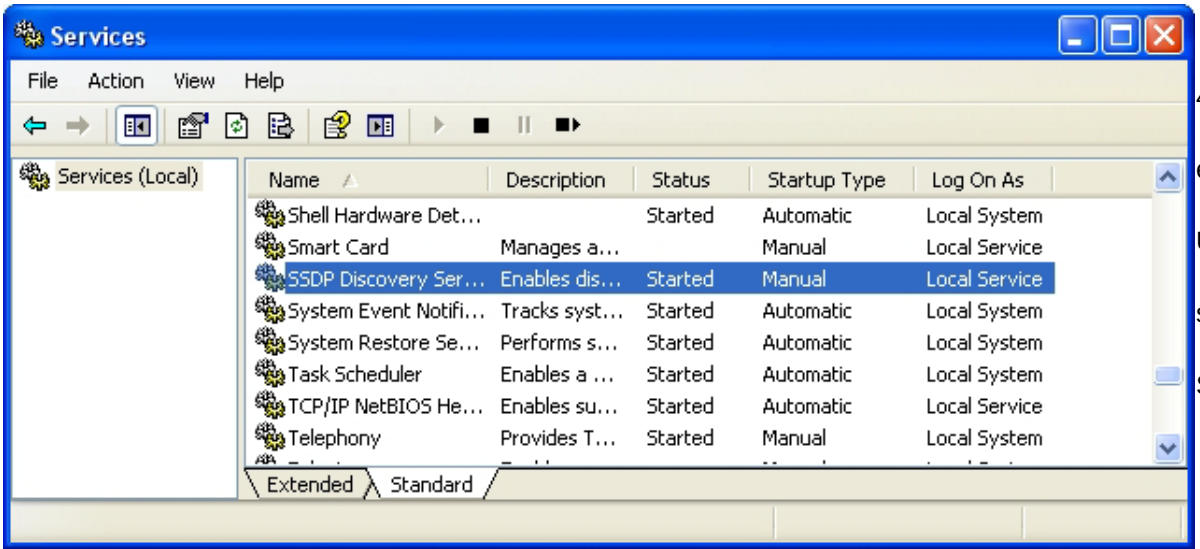
1. Open the "***Add/Remove Programs***" control panel, and then click on "***Add/Remove Windows Components***" in the sidebar. Scroll down and find "***Networking Services***", highlight it, and then click ***Details***.


Windows Components Wizard
Windows Components
You can add or remove components of Windows XP.
To add or remove a component, click the checkbox. A shaded box means that only part of the component will be installed. To see what's included in a component, click Details.
Components:
Message Queuing 0.0 MB
MSN Explorer 20.7 MB
Networking Services 0.3 MB
Other Network File and Print Services 0.0 MB
Outlook Express 0.0 MB
Description: Contains a variety of specialized, network-related services and protocols.
Total disk space required: 56.8 MB
Space available on disk: 33156.3 MB
Details...
< Back
Next >
Cancel

2. In the "**Networking Services**" window, ensure that the "***Internet Gateway Device***" and "***UPnP User Interface***" options are checked. If they are not, check it to enable them, as shown below, and click Ok to continue.


Networking Services
To add or remove a component, click the check box. A shaded box means that only part of the component will be installed. To see what's included in a component, click Details.
Subcomponents of Networking Services:
Internet Gateway Device Discovery and Control Client 0.0 MB
Peer-to-Peer 0.0 MB
RIP Listener 0.0 MB
Simple TCP/IP Services 0.0 MB
UPnP User Interface 0.2 MB
Description: Displays icons in My Network Places for UPnP devices detected on the network. Also, opens the required Windows Firewall ports.
Total disk space required: 56.8 MB
Space available on disk: 33153.4 MB
Details...
OK
Cancel

3. Next, in the "**Control panel**", open the "***Administrative Tools***" and then open "***Services***". Scroll down until you find the "***SSDP Discovery Interface***". If the Status is not ***Started***, double-click on *SSDP Discovery Interface* to open the service properties. Change the startup type to ***Automatic***, then close the properties. Now, right-click on *SSDP Discovery Services*, and choose ***Start*** from the pop-up menu. The SSDP Discovery Service will then be running and start each time you boot.


Services
File Action View Help
Services (Local)
Name Description Status Startup Type Log On As
Shell Hardware Det... Started Automatic Local System
Smart Card Manages a... Manual Local Service
SSDP Discovery Ser... Enables dis... Started Manual Local Service
System Event Notifi... Tracks syst... Started Automatic Local System
System Restore Se... Performs s... Started Automatic Local System
Task Scheduler Enables a ... Started Automatic Local System
TCP/IP NetBIOS He... Enables su... Started Automatic Local Service
Telephony Provides T... Started Manual Local System
Extended Standard

4. After enabling UPnP and starting the SSDP

Discovery Service, it may take few minutes for the “Air Force One 5” to be discovered and appear in your “***My Network Places***”.